

POPULAR Computing WEEKLY

35p 22 December 1983-4 January 1984 Vol 2 No 51

This Week

Commodore 64 games
Mike Grace puts hand to joystick as he reviews another selection of CBM 64 games See page 16

Christmas cards
Keith and Steve Brain present a program which enables you to print your own Christmas cards on the Dragon 32 See page 24

Prolog
David Kelly talks to Keith Clark, co-author of micro-Prolog for the Spectrum, about the program's development See page 13

New releases
All the latest software games including *Two Gun Turtle* from Lothlorien and *Kick Off* from Bubble Bus See page 64

STAR GAME
Santa's Mission on 16/48K Spectrum.
See page 10.

News Desk

Spiderman to star in new adventure

ADVENTURE International has concluded a deal with the Marvel Comics Group to put characters from the comics into a new range of adventure games

The agreement means that many of the Marvel comic book heroes — Spiderman the Incredible Hulk Dr Strange, the Fantastic Four, the X Men, and many more — will be featured in future Adventure International programs

The idea is to link the launch of each adventure game with the publication of a Marvel comic illustrating the story

The first of the Marvel adventure games will appear in May Versions of each program will be developed to run on the Atari Commodore 64 Spectrum BBC and Electron machines

The Atari and Commodore titles will be written in the US while the Spectrum and Acorn conversions will be carried out in this country by Adventure International UK

The UK branch, formed by Cont p 5

This is the age of the robot

PERSONAL robots are to begin their march on to British soil early in 1984

American company Androbot has concluded a deal with Sinclair distributor Prism to market the company's three computer-controlled beasts — *Fred Bob XR* and *Topo*, beginning in January Each of the devices will be compatible with the BBC, Spectrum and Commodore 64 micros

First to arrive will be Topo, the most advanced of the motorised robots, which connects to a home micro by an infra-red link Topo has its own on board computer and is capable of remembering its own environment and reacting to instructions sent to it from the master computer A number of add-on units gives Topo advanced capabilities — a grabbing arm a vision system and a speech synthesiser Manual control directly from the micro is possible using a joystick

Fred, the least expensive of

Continued on page 5

Continued on page 57

BRITAIN'S BEST-SELLING MICRO WEEKLY


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22 December 1983-4 January 1984 Vol 2 No 51

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Popular Computing Weekly
12-13 Little Newport Street
London WC2 [illegible] D
Telephone 01-437 4343
Published by Sunshine Publications [illegible]
Typesetting, origination and printing by [illegible] Press, Chesham, Bucks
Distributed by S M Distribution
London SW9 01-274 8611 Telex [illegible]

ABC [illegible]

Registered at the Post Office as a newspaper

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Popular Computing Weekly cannot accept any [illegible] for any errors in programs [illegible] although we will always try [illegible]

This Week

Editorial

To those of us brought up on a diet of comic-book heroes, the link-up between Marvel and Adventure International comes as no surprise.

The Incredible Hulk, Thor, Spiderman, The X-Men and the rest have been battling evil-doers for 30 years or more. They have appeared in countless comics, books, tv series and films. It is about time they appeared on computer too.

What is perhaps more surprising is that these superheroes continue to appeal to each succeeding generation of adolescents. Why should an irradiated green monster, and his mild-mannered alter ego Dr Bannister, be so popular? Just what is the attraction of the web-shooting Spiderman who spends almost as much time worrying about girlfriends and Aunt May as he does fighting crime?

Perhaps part of the answer lies in the split personalities assumed by most of the superheroes. Thor, Hulk, Spiderman *et al* appear as quite ordinary, often mundane, people in their everyday lives. Their secret identities are known only to a few trusted friends and, of course, the reader.

Whatever the reason for the success of these 'wunderkind', there is no doubt that they are as popular today as they were in the 1950s. Their appearance on computers should increase that popularity still further.

Next Thursday

This double issue of *Popular Computing Weekly* will last for two weeks. The next edition will appear on 5 January, 1984.

Finally, a very merry Christmas to all our readers.


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Adventure

Continued from page 1

Mike Woodroffe a year ago, has spent its time so far producing Spectrum and Acorn conversions of the existing 12 Scott Adams adventures All the conversion work on these programs has been undertaken by Digital Fantasia founder Brian Howarth and it is likely that he will be involved in work on the Marvel comic programs

Scott Adams

Adventure International UK has recently released the first four Scott Adams adventures for the BBC machine *Adventureland*, *Voodoo Castle*, *Pirate Adventure* and *Secret Mission*, each priced at £7 95 The first Spectrum titles — *Adventureland* and *Pirate Adventure* both £9 95, will include graphics and appear in January 1984

The remaining Scott Adams adventures will be released one by one until towards the end of 1984 all 12 will be available for the BBC, Electron and 48K Spectrum computers

Monopoly game makers in new battle

AUTOMATA has launched an appeal for funds to help continue its legal battle with board-game makers Waddingtons over its property trading computer game *Automonopoli*

On Tuesday last week the disagreement which began in June, took a more serious turn when Waddingtons began legal proceedings against Automata to gain an injunction to stop sales of the Automata game, pending a full trial planned for late January

Prior to the new Waddingtons action it seemed that the dispute between the two companies had been settled In July Automata agreed to change the name of its game on its advertisements and packaging from *Automonopoli* to *Go To Jail* This followed a complaint from Waddingtons that the public might confuse the Automata computer game with its own box boardgame *Monopoly*

"As far as we knew then' commented Automata's Mel Croucher on Saturday, "that was the end of it They knew we had *Go To Jail* out and the notice of the injunction hearing on Friday came as a complete surprise '

Although Waddingtons intends to proceed with its court action in January it has now agreed to drop its injunction attempt pending discussions between the two companies this Monday, December 19

At present there are some 13 computer versions of property trading games on sale by software houses in the UK, and the renewed Waddington action against Automata seems to have arisen because the company is discussing with Parker Brothers the possibility of developing jointly an official computer version of *Monopoly*

Automata however is claiming that the idea of a property trading game has passed into common usage "You cannot patent words like 'go to jail or 'chance'," says Mel Earlier this year Parker Brothers lost its rights to trademark the Monopoly name in the US The US court decided that Monopoly had indeed passed into common usage No such decision has been reached by a British court

Automata has now launched a campaign to raise funds to fight its case In so doing it has the support of the Computer Trade Association CTA secretary Nigel Backhurst commented The Waddingtons action represents a major threat to the whole computing industry If they win about 80 per cent of the games software in the market would become challengable "

Your robot

Continued from page 1

the three machines will arrive next and will sell for under £200 Although lacking the sophistication of Topo, Fred is still capable of remote control through an infra-red link

Explained Prism's development manager Graham Daubney "In the US the main thrust with Androbot development has been with the Apple computer, but Prism is developing its own high-level robotics language to make the robots compatible with the BBC, Spectrum and Commodore 64 computers "

Graham Daubney

Androbot which manufactures Fred, Bob and Topo, was formed two years ago by Atari's founder Nolan Bushnell Bushnell sold Atari to Warner Communications in 1979

To supplement the arrival of the personal robots in the UK, Prism's associated publishing company ECC plans a new monthly magazine *Your Robot* due to be launched in March

ITV says 'No' to micro

THE independent television companies have decided not to market an ITV micro

At a meeting held in London on Monday, December 12, representatives of the ITV companies voted against a plan to offer a rival for the BBC's Acorn computer Talks have been in progress for some time between the ITV companies and London computer manufacturer Transam with a view to providing such a machine

Two reasons have been given for the decision First, the Broadcasting Act, under which the ITV companies operate, prohibits any form of sponsorship The endorsement of an ITV micro, was considered to be a form of sponsorship rather than an extension of ITV's public service role

Secondly, the ITV companies were concerned about the possible conflict of interest between an ITV micro and advertising from companies offering competing products

"The tv companies see themselves as software providers — in the form of programmes — rather than as hardware providers " commented the Independent Television Companies Association secretary, Ivor Stolliday

He dismissed suggestions that individual ITV companies, originally in favour of the micro plan, might go ahead alone 'The debate has taken place at the most senior level and every company has come around — I think the decision will stick "

Breaker, breaker

COMPUTER magazine publisher VNU has agreed to pay Acornsoft £65 000 damages This follows the publication of an article by Guy Kewney in the January edition of *Personal Computer World* explaining how to break into protected Acornsoft programs

More robots

COLNE Robotics has been given more money by its backer Prutec, to help it develop its low-cost computer-controlled robots

The company has now been given a further £200 000 to add to the £150 000 it received in May 1981

Colne manufactures the Zeaker micro turtle and a five axis robot arm — the Armdroid 1

1m Spectrums

SINCLAIR has announced the manufacture of its one-millionth Spectrum computer

The record-breaking machine rolled off Timex's Dundee production line on December 9

The Spectrum is fast catching up the ZX81 which has so far sold 1 1 million units — it is expected that the Spectrum will overtake the ZX81 in early February

Since the Spectrum was launched sales have been running at an average of over 50,000 a month



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Atic Atac solution

I am writing to claim to be the first person to complete Ultimate's new adventure, *Atic Atac*. After completing it in 20.06, I scored 33790 and finished 85 percent. My high score is 54870 and 95 percent.

The way to solve it is not, like Ultimate's other games, to simply blow all the monsters to bits, but to draw a map as you go. Hint: there are three pieces to the key — the round bit, one with 'AC' on it and one with '6.

PS My *Chuckie Egg* high score is 221,230.

Andrew Pennell
Essex

Save instruction

Thank you for publishing my letter in issue 48. Since then I have noticed a small error in my letter. I said that the machine code should be saved with

```
SAVE "COPY" CODE 65115,36
```

This is slightly wrong. It should be

```
SAVE "COPY" CODE 65115,37
```

This small error causes the last byte of the code to be missed out. The last byte is a 'RET' instruction and without it the computer locks up after you type

```
RANDOMIZE USR 65115
```

To save having to type the code in again just load the routine, type *Poke 65151, 201*, and save the code again using the correct save instruction above. The routine should now work once loaded.

Karl Hampson
57 Harsnipe
Birch Green
Skelmersdale
Lancs WN8 6QA

Dragon data files

Dragon discs have not been fully investigated yet, and the manual is only a preliminary version, so there are many points that have not yet been documented. One of these concerns the creating of data files. If you use your discs for databases then you will need to use a string variable in conjunction with the Create command, eg

```
10    INPUT NAME$
20    CREATE NAME$, 255
```

This will create a Data file 255 bytes long and with the file name of *Name$*. However if *Name$*= " " then you will create a file that cannot be accessed in the normal way. It will appear on the directory as

```
      DAT 255
```

No name? You may be able to *Sread* it, that is to say *Sector Read* if you know where it lives. I suggest that you include another line in your program.

```
15    IF NAME$= " " THEN
      GOTO10
```

This will ensure you do not lose any valuable data files or waste disc space as you cannot *Kill* the file because it has no name.

Hywell Francis
TWM Software
8 Azalea Close
Cyncoed
Cardiff

Escape from Jaws

I would like to hear from anyone who has got past the sharks in *Aquaplane*. I already have and have now got to stage 6, stage 4 has the sharks while stage 5 includes logs, rocks, speed-boats and yachts. Stage 6 has logs, rocks, sharks and yachts. My score was 6600.

John Barnes
80 Treharne Road
Treswithan
Camborne
Cornwall

"I'm sorry ITV aren't marketing a micro – I was rather looking forward to a second channel"

Torture, slavery . . .

How can Mr Croucher denounce 'shoot 'em up' games in the same magazine as an Automata advertisement appears depicting torture, slavery, trickery and deceit, as well as a demented old Father Christmas on the verge of shooting himself? That is what is sick (and hilariously funny) — not *Space Invaders*.

What is more, the three commercial programmers that I know have never even contemplated mass murder (although software critics may sometimes drive them towards it).

I think, however, that if Mr Croucher genuinely holds this opinion he does have a good point — but it is a great free pre-Christmas plug for Automata's non-violent games (so is this, I suppose). Anyway up with Attila the Hun, Jack the Ripper, violent games and the Piman.

Michael Clark
16 South Street
South Petherton
Somerset TA13 5AD

PS Merry Christmas and a prosperous New Year to Automata and all the readers (that saved me a lot of Chrissy cards).

. . . aggression and conflict

I felt that I must write to you, to help you explain a few facts to the extremely narrow-minded Mel Croucher. I have just completed a social sciences course on aggression and conflict and would like to put Mel right on a few points.

Through my studies I found that the most common cause of aggression was frustration and, although I also learnt that if aggression is allowed to build up violence will result in many cases, I say to Mel Croucher 'Is there a more harmless way of relieving violent tendencies in children than playing video games?'

On a last note, as frustration is the biggest cause of violence, do you think that such dangerously frustrating games as *Pimania* should be withdrawn from the market? Knowing Mel's feelings on protecting children, I am sure he will comply now I have made the facts clear to him.

James Hickman (15)
27 Fallow Walk
Spring Park
Northampton

High score answer

High scores — I have the answer.

1. Build a codeword generator into games that reveals a codeword unique to each individual score.
2. High scores can then be matched with the codeword and thus verified.
3. *Splat!* already does this in conjunction with a £500 competition.
4. Some day all arcade games will be made this way.

Ian Andrew
Incentive Software
54 London Street
Reading
Berks

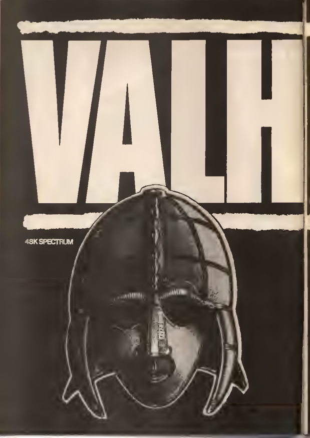
Scrabble options

Whilst playing *Scrabble* the other night I accidentally pressed the wrong key(s) and discovered two more 'options' not shown in the accompanying instruction booklet. These are *D* which gives you the letter distribution and *T* which gives you the tile values.

I also achieved a draw (the impossible?) against my Spectrum and the program self-destructed. Is this a bug, Psion's revenge or just my Spectrum getting tired as usual?!

Robert Steele
27 Fields Road
Wootton
Beds MK43 9JJ

Scrabble obviously still has a few idiosyncrasies waiting to be discovered, though these should not detract from an otherwise excellent program.


VALH
48K SPECTRUM

Santa's Mission

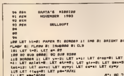
A new game for 16/48K Spectrum by Paul Sellin

The object of the game for 16K or 48K Spectrum is to get Santa safely off his sleigh and on to a chimney-top. He must then visit every room where he will put down a present.

He can climb up and down chimneys and ladders, but he must be quick as his escape route can be filled-in behind him! Santa can also dig (using key *D*) and eat food from the tables on the ground-floor (key *E*). Beware of getting drunk as his stumbling will wake up the family if he goes upstairs, and if Santa is too fat he will not fit up the chimney.

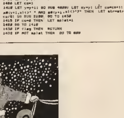
Movement is by *Q* and *A* for up and down and *Z* and *X* for left and right. *Q* will also call up the sleigh when Santa is on a chimney-top, and it will also let him jump on to the sleigh to win the game when every present has been put down.

■



```
  90 REM      SANTA'S MISSION
  91 REM      NOVEMBER  1983
  92 REM
  93 REM          SELLSOFT
  94
  95
  96
 100 LET ht=0: PAPER 5: BORDER 1: INK 0: BRIGHT 0:
FLASH 0: FLASH 0: INVERSE 0: CLS
 101 LET t=0: LET a= 85
 105 GO SUB 8000: GO SUB 9200
 110 BORDER 1: LET y=-2: LET x=1: LET drop=0: LET jump
=1: LET splat=0: LET str=5: LET gin=0: LET max=5: LET
tot=12: LET ox=x: LET oy=y: LET cx=x: LET cy=y
 115 LET flag=0: LET p$="HJKL
": LET w$="NOPQ                    M": GO TO 3010
 120 LET w$=INKEY$: IF w$="" THEN  GO TO 700
 121 LET x=x+(w$="x")-(w$="z")
 123 IF w$="a" THEN  LET y=y+1
 130 IF w$="q" AND y=3 THEN  GO TO 5000
 133 IF y<=8 AND w$="q" AND a$(y,x)="B" THEN  LET y=y-
1: GO SUB 870: GO TO 1000
 135 IF y>4 THEN  IF w$="q" AND (a$(y-1,x)="A" OR a$(y-
2,x)="B") THEN  LET y=y-1: GO SUB 870: GO TO 1000
 140 IF w$="d" THEN  GO TO 1700
 200 IF a$(y,x)="C" THEN  GO TO 1200
 210 GO SUB 4000
 215 IF a$(y+1,x)=" " OR a$(y+1,x)="7" OR a$(y+1,x)="/"
THEN  GO TO 1400
 225 IF a$(y,x)="7" AND dee<5 THEN  GO TO 1650
 230 IF w$="e" AND a$(y,x)="/" THEN  GO TO 1500
 235 IF a$(y,x)="S" THEN  GO TO 1900
 270 GO TO 800
 700 IF NOT str THEN  GO TO 9000
```

```
 702 IF RND>a THEN  GO TO 800
 705 LET j=RND*5+7: LET k=RND*30+1
 710 IF a$(j,k)=" " OR a$(j,k)="7" OR a$(j,k)="/" THEN
GO TO 700
 715 GO TO 800
 730 IF a$(j+1,k)=" " OR a$(j+1,k)="7" OR a$(j+1,k)=
"/" THEN  LET j=j+1: GO TO 730
 735 PRINT  INK 1;AT j+4,k-1;"C": LET a$(j,k)="C"
 830 IF tot=0 THEN  BORDER 3
 840 LET ox=x: LET oy=y: LET cx=x: LET cy=y
 850 GO TO 120
 875 IF y>16 THEN  LET y=16
 880 IF y<1 THEN  LET y=1
 885 IF x>31 THEN  LET x=31
 890 IF x<1 THEN  LET x=1
 895 RETURN
1005 LET str=str- 1: GO SUB 2100
1010 IF str<=0 THEN  GO TO 9000
1020 IF a$(y,x)="/" AND gin>0 THEN  LET y=y+1: BEEP
.05,0: BEEP .05,0: GO TO 800
1030 GO SUB 4000
1035 BEEP .05,24: GO TO 800
1210 LET x=cx: LET y=cy
1220 BEEP .05,12: BEEP .05,12
1230 GO TO 800
1405 LET oy=y: LET ox=x
1406 LET co=1
1410 LET y=y+1: GO SUB 4000: LET oy=y: LET co=co+1: IF
a$(y+1,x)<>" " AND a$(y+1,x)<>"7" THEN  LET str=str-
co/5: GO SUB 2100: GO TO 1030
1415 IF co=6 THEN  LET splat=1
1420 GO TO 1410
1430 IF flag THEN  RETURN
1432 IF NOT splat THEN  GO TO 800
```





```
1435 PRINT  INK 2; PAPER 5; FLASH 1;AT y+4,x-3;"SPLAT!": FOR q=12 TO 0 STEP -1: BEEP (12-q)/40,q-13: NEXT q
1440 GO TO 9000
1505 BEEP .1,12: BEEP .1,16: BEEP .1,12: BEEP .1,16: BEEP .1,19
1510 LET no=RND*3+1: IF RND>.5 THEN  GO TO 1525
1515 PRINT #0;AT 0,0;" F O U N D  T H E  S H E R R Y !": FOR j=1 TO no: PRINT #0;"F ";: NEXT j: PRINT
1520 LET str=str+no*2: LET dex=dex-no: GO SUB 2000: GO SUB 2100: GO TO 1535
1525 PRINT #0;AT 0,0;"G O T  T H E  M I N C E  P I E S"
1530 FOR j=1 TO no: PRINT #0;"E ";: NEXT j: PRINT : LET str=str+no*2: LET gir=gir+no: GO SUB 2100: GO SUB 2000
1535 LET a$(y,x)=" "
1540 PRINT AT y+4,x-1;"8";AT y+3,x-1;"#"
1541 FOR i=1 TO 100: NEXT i
1545 PRINT #0;AT 0,0;"
     "
1550 GO TO 600
1655 IF RND*27>dex THEN  GO TO 1670
1660 LET t=t-dex+5: PRINT  FLASH 1; INK 2; PAPER 4;AT 2,0;"   Careful - You're drunk!!      ": PAUSE 200: PRINT AT 2,0;"                                ": GO TO 600
1670 PRINT  INK 2; FLASH 1;AT 0,0;"          W H O O P S          ": PRINT : PRINT : PRINT  FLASH 1; INK 3;"The kids woke up and got you!! ": PAUSE 300: GO TO 9000
1700 BEEP .05,6: BEEP .05,0: BEEP .05,10
1710 PRINT #0;AT 0,0;"Direction to dig?  CAPS for down         Normal for sideways"
1715 LET q$=INKEY$: IF q$="" OR (q$<>"z" AND q$<>"x" AND q$<>"Z" AND q$<>"X" AND q$<>"q" AND q$<>"a") THEN  GO TO 1715
1720 LET dx=x+(q$="x" OR q$="X")-(q$="z" OR q$="Z"): LET dy=y+(q$="Z" OR q$="X" OR q$="a")-(q$="q")
1735 INPUT INKEY$
1740 FOR v=1 TO 4+RND*7: LET t=t-1: LET str=str-.2: LET gir=gir-.2: LET dex=dex+.2: GO SUB 3000: GO SUB 2100: GO SUB 2200: GO SUB 4000: BEEP .05,6: BEEP .05,0: BEEP .05,10
1745 IF str<=0 THEN  GO TO 9000
1747 NEXT v
1750 GO SUB 4000: LET a$(dy-1,dx+1)=" ": LET a$(dy,dx)=" ": PRINT AT dy+3,dx-1;" ";AT dy+4,dx-1;" ": GO SUB 6000
1760 GO TO 600
1910 LET t=t+30*str: LET oy=y: LET ox=x: PRINT  OVER 1; INK 1;AT y+4,x-1;"2"
1920 LET tot=tot-1: LET a$(y,x)=" ": GO TO 600
1930 BEEP .05,12: BEEP .05,12: BEEP .05,16: BEEP .05,16: BEEP .05,19: BEEP .05,19
2001 IF dex>10 THEN  LET dex=10
2002 IF dex<0 THEN  LET dex=0
2005 IF dex<5 THEN  PRINT  BRIGHT 1; FLASH 1; PAPER 5;AT 0,10;INT dex; FLASH 0;" ": RETURN
2010 PRINT  BRIGHT 1; PAPER 5;AT 0,10;INT dex;" "
2105 IF str>10 THEN  LET str=10
2110 PRINT  BRIGHT 1; PAPER 6;AT 0,4;INT str+1;"  "
2115 RETURN
2205 IF gir<0 THEN  LET gir=0
2210 PRINT  BRIGHT 1; PAPER 4;AT 0,27;INT gir
2220 RETURN
4010 PRINT  OVER 1;AT oy+4,ox-1;"8";AT oy+3,ox-1;"#"
4020 PRINT  OVER 1;AT y+4,x-1;"8";AT y+3,x-1;"#"
4030 RETURN
5005 LET flag=0
5010 LET p$=" JKL                          ": LET m$="NOPQ R"
5015 LET c=1: LET m=1: FOR r=31 TO 1 STEP -1
5020 LET r$=p$(r TO 31)+p$(1 TO r-1): LET t$=m$(r TO 31)+m$(1 TO r-1): LET m=m+1: PRINT  INK 2;AT 2,0;r$;AT 3,0;t$
5025 IF flag THEN  GO TO 5090
5030 IF INKEY$<>"a" AND INKEY$<>"q" THEN  GO TO 5070
5031 BEEP .05,12
5035 IF y<2 THEN  GO TO 5100
5040 LET y=y-3: GO SUB 4000: IF x=m THEN  GO TO 5200
5045 BEEP .05,0: BEEP .05,0: LET flag=1: GO SUB 4020: GO SUB 1410: GO SUB 4020: GO TO 5200
5070 IF str<=0 THEN  GO TO 9000
5095 NEXT r: IF NOT flag THEN  GO TO 5015
5100 LET flag=0: PRINT AT 2,0;"     ";AT 3,0;"     ";AT 3,50;" ": GO TO 600
5150 LET x=m: REM  IF m<6 THEN  LET m=31+m
5160 LET oy=y: LET y=1: LET ox=x: LET p$=" JKL                          ": LET flag=1: GO SUB 1410: PRINT AT 1,x-1;"  ": GO TO 5200
5200 GO SUB 4030: LET q$="HJKL  ": IF tot<=0 THEN  GO TO 7500
5205 GO TO 5070
7010 LET s=s+.05: PRINT  FLASH 1; INK 1; PAPER 4;"MISSION ACCOMPLISHED         "
7015 PRINT  PAPER 6; INK 2;AT 4,7;"SCORE SO FAR:";INT t;AT 5,0;"HI SCORE:";INT ht
7020 FOR d=0 TO 30: BEEP .05,d: NEXT d
7025 LET flag=0: PAUSE 300: GO TO 100
7999 STOP
8005 RESTORE 8100: DIM a$(17,32)
8010 FOR x=3 TO 17
8015 READ b$
8020 LET a$(x)=b$
8030 NEXT x
8040 RETURN
8110 DATA "     CBC      CBC      CBC      CBC"
8111 DATA "     CBC      CBC      CBC      CBC"
8115 DATA "CCCCCCBC CCCCCBCCC CCCBCCCCCCCCBC"
8120 DATA "C7777CBC77777CBC77777CBC77777CBC"
8125 DATA "C7777CBC77777CBC77777CBC77777CBC"
8130 DATA "CBTABCBCTBTATCBCBTTATCBCBTTATCBC"
8135 DATA "CCCACCBC CCACCBCCCCACCBCCCCACCBC"
8134 DATA "C77ATCBC777ATCBC777ATCBC777ATCBC"
8137 DATA "C77ATCBC777ATCBC777ATCBC777ATCBC"
8138 DATA "CATABCBCTATABCBCTATABCBCTATABCBC"
8139 DATA "CACCCCBC ACCCCBCCACCCCBC ACCCCBC"
8140 DATA "CAT77CBCTAT77CBCTAT77CBCTAT77CBC"
8145 DATA "CAT77CBCTAT77CBCTAT77CBCTAT77CBC"
8150 DATA "CA BF   C BBF    C BBF    C BBF    C"
8155 DATA "CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC"
8205 INK 1: CLS
8210 FOR y=2 TO 17
8214 LET m=144+(a$(y,x)="L")+(a$(y,x)="C")*2+(a$(y,x)="W")*3+(a$(y,x)="F")*0
8215 REM  IF a$(y,x)="F" THEN  PRINT AT y+4,x;"F": GO TO 8250
8220 REM  IF a$(y,x)="B" OR a$(y,x)=" " THEN  GO TO 8250
8225 REM  IF a$(y,x)="C" THEN  PRINT AT y+4,x;"B": GO TO 8250
8230 REM  IF a$(y,x)="W" THEN  PRINT AT y+4,x;"C": GO TO 8250
8240 REM  IF a$(y,x)="L" THEN  PRINT AT y+4,x;"A"
8250 PRINT AT y+4,0;a$(y): NEXT y
8255 FOR y=9 TO 21: PRINT AT y,0;"C": NEXT y
8265 PRINT AT 0,0; BRIGHT 1; INK 0; PAPER 6;"STREN:"; PAPER 5;TAB 12;"DEXT:";TAB 22; PAPER 4;"GIRTH:"
8270 INK 0
8290 RETURN
9005 PRINT  FLASH 1; INK 2;AT 2,0;" HARD LUCK SANTA - MISSION OVER ": IF ht<t THEN  LET ht=t
9007 PRINT  PAPER 4;AT 4,10;"SCORE:";INT t;AT 5,0;"HI SCORE:";INT ht
9010 FOR d=0 TO -36 STEP -1: BEEP .05,d: NEXT d
9015 PAUSE 0: GO TO 101
9020 STOP
9750 REM start
9770 CLS : PRINT "Please wait..."
9780 RESTORE 9900: FOR f=USR "a" TO USR "t"+7 STEP 8
9785 FOR n=0 TO 7: READ a: POKE f+n,a: NEXT n: NEXT f
9790 RUN
9800 CLEAR
9810 SAVE "Santa" LINE 9750
9820 PRINT  INK 7; FLASH 1; OVER 0;"        REWIND TO VERIFY       "
9840 VERIFY "Santa"
9860 PAUSE 50: RUN
9900 FOR y=1 TO 17: FOR x=1 TO 31
9910 IF a$(y,x)="W" THEN  LET a$(y,x)="C"
9911 IF a$(y,x)="L" THEN  LET a$(y,x)="A"
9912 IF a$(y,x)="C" THEN  LET a$(y,x)="B"
9913 IF a$(y,x)="F" THEN  LET a$(y,x)="F"
9914 IF a$(y,x)="F" THEN  LET a$(y,x)="B"
9915 IF a$(y,x)="B" THEN  LET a$(y,x)="T"
9920 NEXT x: PRINT y+1: NEXT y
9900 DATA 28,126,66,66,66,126,66,66,129,129,129,129,129,129,129,129,255,17,255,68,255,136,255,34,0,68,124,84,16,16,56,0,81,74,0,60,255,126,60,0,0,0,24,60,255,60,64,60,183,183,183,60,36,36,36,102,24,60,102,82,60,24,126,90,0,42,22,66,42,54,42,42,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,255,0,60,16,20,62,62,128,240,255,255,24,24,24,24,255,127,254,255,3,3,3,3,255,255,255,241,1,0,24,12,255,240,255,255,255,252,224,160,33,65,248,246,254,192,160,160,16,48,0,124,66,66,124,48,60,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
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And now the Prolog

***David Kelly** talks to Keith Clark, co-author of micro-Prolog*

Artificial intelligence is no longer a dirty word in computing circles.

The days when the subject was regarded as being a preoccupation of woolly academics and of little practical use are long gone. On the contrary, AI is now one of the most important areas of computer development. Japan's Fifth Generation project is dedicating much of its energies in this direction and a great deal of interest has been shown in so-called expert systems — a practical off-shoot of AI research.

It is this sort of work which now enables a robot not only to pick things up, but to carry on undaunted even if the object to be collected has fallen over and rolled from its proper position. The computer system driving the robot can immediately work out what has happened and alter its commands to pick up from the new position.

The reason AI has caused a great deal of excitement is that this type of reaction is pretty much what a human would do in the same circumstances — hence the term artificial intelligence.

One of the people closely associated with the AI field is Keith Clark at Imperial College, London. He says: "Robots can now plan for change.

"These so-called flexible robot systems mean that a machine can, for example, take a series of components in any order and still be able to assemble them together."

These sorts of techniques are now also beginning to appear in the more established areas of computing — word processing and data base management.

The interesting thing about AI research and its developments is that they are the results of a whole new way of thinking about computers representing a radical departure from traditional programming methods.

AI programming is based around the manipulation of words and concepts rather than of numerical information. The ideas involve communicating with the computer in ways much more closely aligned to natural language — beginning to approach the idea of talking to a computer in normal English.

This is called Logic Programming. Bob Kowalski, also at Imperial, is credited with much of the early work in this field. The crucial idea is to use sets of sentences as programs — symbolic logic rather than numeric logic.

Different ways of thinking produce different solutions to problems and AI research has produced a number of symbolic programming languages. Lisp is one, but the up-and-coming star is Prolog.

Prolog was first devised in 1972 by Colmerauer and Roussell, writing in Algol. The first version for a micro was written on a Sorcerer at Imperial by Frank McCabe in 1979.

Says Keith: "Prolog is about reasoning with statements rather than with numbers.

"With a Basic program you have to work through the program to find out what it is doing. Prolog says what it is doing. A Prolog program looks like a description of what you want it to do."

If all this sounds rather strange, then it is probably better to look at a specific example. Consider the simple Basic program to print the greater of two numbers:

```
10 INPUT X Y
20 IF X>Y THEN 5
30 PRINT Y
40 GOTO 6
50 PRINT X
```

As a Prolog program this would be written as:

```
y greater-of (x y) if x LESS y
x greater-of (x y) if not x LESS y
```

Using the Prolog program is also quite self-explanatory. To find the greater of two numbers 5 and 10 use:

```
which (x x greater-of (5 10))
```

This is called Rule-Based programming. The logic for it goes back to Aristotle and the ancient Greeks, but more recently much work was achieved by the Logicians at the beginning of this century — people like Frege in Germany and Bertrand Russell in this country. However, it is only with the computers now available that much progress has been made.

Prolog has been selected by Japan as the language for its Fifth Generation research work in the Expert Systems field.

"As a programming language, Prolog has a number of advantages," says Keith. "It has a very simple syntax. It can be read much like English and has the semantics of normal sentences.

"As an example of the sort of things it can do, Rand in the US wrote a war-crisis simulation program in a similar rule-based language, Rosie. They were running it with all the American Generals there, but something was wrong with the strategy part of the program. They listed it out there and then and the language was sufficiently high-level for the Generals, who had no knowledge of programming, to point out where the logic in the program was wrong.

"If that program had been written in Pascal or Basic, then there is no way that would have been possible.

"Fundamentally, Prolog is describing rather than instructing, unlike Basic. Prolog is termed a declarative language and it has no algorithms — *For/Next* loops and so on, as there are in Basic.

"It is only in the last 15 years that new work at Edinburgh has made symbolic logic viable as a programming language. Prolog is just a formal version of symbolic logic using predefined statements to build up sentences and using inferences with those sentences to find answers."

A development of this has been the intelligent database. This is a database that is capable of acquiring new knowledge as it goes along. If it doesn't know the answer to a question, it will ask questions itself to try and get the information to answer the problem. Such a database starts off empty and uses question and answer techniques to build up a store of "experience". It operates rather in the same way that a child learns.

In one sense, such an intelligent database can be thought of as a list processor, building up and rearranging lists of facts.

Since Frank McCabe and Keith Clark produced the first implementation on a micro in 1979, the versions of micro-Prolog have been continuously refined. There are now broadly three different versions of the language designed to work with the Z80, 8086 and 6502 processors. These versions have been further refined to produce specific implementations on the Apple, IBM and Osborne computers.

In November, the team produced its most sophisticated version yet — for the 48K Spectrum! Published by Sinclair Research, the cassette-based version of micro-Prolog costs £24.95 and comes with a hefty paperback book explaining the basics of logic programming in Prolog.

"For a long time Clive didn't show much interest in Prolog, then he suddenly became very enthusiastic. Sinclair is now devoting quite a lot of effort to challenging the Japanese Fifth Generation project with its own work in AI — particularly now it has set up its Metalab research facility."

The Spectrum version of micro-Prolog has over 60 pre-defined command words such as *Less* and as in Forth, these can be used to define other keywords, extending the language as required by a particular program. Micro-Prolog also features a built-in editor and error checking system.

Prolog will next be launched on the Acorn machine. The program is now finished and under test at Acorn. Acornsoft plans to release it for both the Electron and BBC machines in the late spring. At about the same time a Commodore 64 implementation should also appear, published by Commodore. ■



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Part III. Fishy Business, in which our hero lands on a watery planet, meets the source of the plea for help, and saves the day.
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All three programs cost £9.95 each and are available for the DRAGON 32, BBC MODEL B and 48k ORIC-1 home computers. (note: Fishy Business for the BBC and ORIC will be available February 1984).
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A stix in time

***Mika Graca** tries his hand at another range of Commodore 64 software*

When the 64 first appeared on the scene most of the software seemed to be unable to utilise the superb graphic and sound capabilities of the machine But with the passage of time, better material has become available

The latest batch of software contains quite a number of games which illustrate the improved use of graphics and sound as well as the use of sprites but I did find as I played them that I became increasingly annoyed at the collision facility of the sprites What Commodore has done (in its wisdom) is make it easy for the programmer to set the sprites so that if two sprites touch then whatever you want will occur — usually the game ends!

But enough of this whining — on with the review

The first game I tried was *Falcon Patrol* from Virgin Games (very competitively priced at £6 95) As most of you are aware Virgin has recently moved from the music and record world into computer software and their experience shows The cassette sleeve has a professional and refreshing appearance (more in line with music cassettes) in that there is none of that tiny script, so beloved of software cassette sleeves

Instead we are given a nicely presented layout of instruction, picture and even a little spiel about the author (one Steve Lee — photograph and all) It appears Virgin are attempting to create personalities out of the programmers (nice to see them recognised officially) with potted life histories for all us punters to learn and dream about

Falcon Patrol consists of a jet plane zooming along over a superbly depicted countryside (trees houses and roads) trying to shoot down the baddies before you yourself run out of fuel (named gas in the program — ugh!) As soon as I began to play this game I had a feeling of *déja vu* as though I'd played the game before Sure enough, a glance through my past reviews for the Vic revealed (in *Popular Computing Weekly* 14-20 July) a game distributed by Quicksilva and called *Skyhawk* which is very similar to *Falcon Patrol*, apart from the enhanced graphics that the 64 will allow However *Falcon Patrol* costs £1 less than *Skyhawk* and is definitely superior in presentation

The jet plane is able to bank twist and crash in a graphically exciting way and the enemy fighters also look much better than in the Vic version The bombs and explosions are more realistic and the sprite ability of passing in front of each other also allows a 3D effect as the plane zooms low in front of the buildings and roads on the ground This game is one of the best I've seen for the 64 so far

Let's move on now to Quicksilva itself, who have a release known as *Quintic Warrior* Priced at £7 95, this game is outclassed quite considerably by *Falcon Patrol* in both value graphics and concept. The cassette sleeve boasts a fearsome berbarian brandishing his ray gun whilst a slightly obscure mound cowers in front of him (I assume the mound to be a mutant from the gist of the explanation) The cover looks extremely professional but this impression is lost immediately upon *Loading* the game — not only is the text layout simple and unimaginative but it's fairly obvious that whoever is responsible for error-checking missed out, as the word *for* is typed twice in the instructions

The instructions within the program are sparse in the extreme consisting of several pages of text concerning our imaginary world — the *Quintic Warrior* is here to fight the baddies while avoiding something known as the Zed ray and various other perils — but omitting any reference to playing the game All this verbiage is really window dressing to hide the fact that once again we have a type of *Space Invaders* — the mutants who look like little *Y*s and gradually move up the screen, whilst a pair of lethal ray guns move up and down the sides of the screen blasting at you

So the game is hardly original But it is fun and my two sons (aged ten and six) seem to get immense enjoyment from playing Shouts of anger joy and frustration accompany the zaps and bleeps (the usual noises in other words) and I found the atmosphere of the game quite impressive There are 21 skill levels (as you move up so you find the mutants increase in number and both they and the Zed rays move faster) and oddly enough we found that increasing the skill level increased the score dramatically

Alligata is presumably a trade name for software from Superior Systems in Sheffield but the cassette I received called *Bat Attack* (costing £7 95) might have been better left out than reviewed On the cassette we are promised fast action machine code high-resolution graphics and imaginative sound effects — but I suppose you could use those words to describe virtually anything these days *Bat Attack* looked amateurish as it *Loaded* and it was At the start of the game a spaceship appears (graphics were okay) from the bottom of the screen as though it were rising from the deep Along the top a horde of batlike baddies also appear and begin to peel off and attack

Up to now this could be one of any number of games but unfortunately here the similarity ends for *Bat Attack* resembles some of the worst games I reviewed for the Vic back in the early days The problem is that you cannot move your ship with the joystick only fire your own rays by pressing the fire button If you want to move you have to press keys *Z* or *X*

I may have sounded harsh over *Bat Attack* (after all, some people don't have joysticks they tell me!) but it's when I compare it with a game like *Stix* from Supersoft that the poor quality shows *Stix* (priced at £8 95 but worth it) is that rare event in a reviewer's life — a truly different game that calls for skill as well as speed and isn't really very complicated at all I haven't seen a game quite so delightful for a long time

Forget all the spiel on the cassette sleeve about hyperspace and field synthesiser — what you have is a random bundle of energy which looks more like a bundle of sticks (hence the title I assume) which is constantly changing shape and moving around inside the screen area Your task is to draw lines around this bundle trapping it in an ever-decreasing space using a little blob which traces vertical and horizontal lines To make life just a little difficult you have two other little blobs chasing you along the lines you have drawn and if one of the sticks should touch your line before it is completed — zappo! You've lost a life.

Mere words cannot describe both the fun and the skill of this gem of a game I found myself returning to it for enjoyment alone (an excellent sign for a slightly jaded reviewer) and I'd put addictability high This game is my favourite of the bunch this time round

Hungry Horace from Melbourne House (£5 95) is really Pacman with a do-it-yourself facility You have four levels of

maze to manoeuvre with *Horace* (eating the fruit as you go) and instead of ghosts, there are a few black "jailers" after you. If you eat the alarm bell the jailers take fright (a neat effect here as their hair stands on end) and you can "eat" them instead. Otherwise it's *Pacman* to a T.

As well as the standard game, though, you can also draw your own maze and save it to cassette once you've learned how to manipulate *Horace* through the mazes provided. This is an excellent addition to the game, although drawing mazes isn't as easy as it looks and I'd advise you to get out your pen and paper first.

This is not the best type of *Pacman* around and in level three I found it nigh impossible to beat the jailer. No doubt it is possible but one of the few problems with arcade games is the difficulty level — just how hard do you make it?

Talking of difficulty brings me nicely to *Crazy Caveman* from Merlin Software at £6.50. Quite a nice title heralds a well-drawn scene of mountains in the background and a sprite-like caveman who has to contend with a load of hazards that the environment is going to throw at him. It's a bit like *Krazy Kong* in concept, but without the gorilla.

First, a number of rocks come rolling along which you have to jump (by moving the joystick forward) and then if you survive that along come another batch. Jumping these rocks is extremely hard as, thanks to the collision facility on the sprites, if you just touch one — bye bye caveman! Eventually, the rocks do stop and dinosaurs appear and come at you with remarkable ferocity. You need to bop these blighters on the head with your axe (realism was never a strong point in computer games — was it?) to survive into the next stage.

This game illustrates a point I've made before — why is it that if you lose all your lives you are forced to go right back to the beginning and start jumping rocks again? It would be nice to have three lives in each stage but be able to short-circuit a stage (if you want to) so that at least the older players like myself can actually get to see the later stages.

Anyway *Crazy Caveman* is not going to set the world on fire — but it's well drawn and fairly priced.

Commodore produces its own software, usually pretty competitively priced and to finish I have a cassette and a cartridge to look at. The cassette is called *Maggotmania* and costs £5.99 — a good price for a good game. The action is pretty fast and the game whilst being the usual zap-it-up type, has a touch of flair which seems to set it apart from much of the competition.

The idea isn't new, of course. This time you are a creature in a field full of deadly flowers and a host of giant maggots, spiders and snails seem to want to get you. The cassette sleeve shows a man amongst these giant insects in the manner of *The Incredible Shrinking Man* (will I ever forget that spider ...) but the actual game is more like the traditional arcade invaders type.

What is good is that the creatures do not come at you with such speed you never have a chance to know what's going on and you have several tasks to accomplish to try and survive. First, you need to destroy a few of the poisonous flowers to clear some room so you can dodge the maggots should they reach the bottom of the screen. Next, you must blast the maggots, spiders and snails with a certain degree of persistence if you wish to "up your score" and stay alive.

The graphics are pretty good (although you are depicted as a slightly insignificant blue meanie) and the spiders are excellent, but the thing I liked best was the satisfactory noise my blaster made as I fired away. Simple this game may be but I found it good fun as well.

Finally, a Commodore cartridge called *Lazarian* priced at £9.95 (which seems excellent in view of those earlier cartridge costs in the Vic-20 days of yore). Oh, the joy of instant *Loading* (don't forget to switch your 64 off first) and off we go.

Lazarian comes with a small booklet of instructions (Commodore has always been excellent in providing clear and concise instructions) and has three phases to play. You are piloting a spaceship (which looks more like a fugitive from some of the *Krazy Kong*s I've seen than a spaceship, but never mind) and you have to rescue various sister ships to get to the next phase. If you manage this you end up by battling the deadly one-eyed space leviathan (Commodore's phrase — not mine) who just happens to be called *Lazarian*.

The 64 is attracting better software now and some of it uses the sprites and other goodies as well. But, as always with any of these games, it's not really the graphics and the sound effects (although they do help with another version of a well-established arcade hit) it's the originality that counts — and for my money *Stix* from Supersoft wins hands down. ■

Firm	Program	Cost	Value(1-10)
Commodore 675 Ajax Avenue Slough Trading Estate Slough Berks	*Maggotmania* *Lazarian*	£5.99 £9.95	7 7
Alligata Superior Systems 178 West Street Sheffield S1 4ET	*Bat Attack*	£7.95	4
Virgin Games 61/63 Portobello Road London W11	*Falcon Patrol*	£6.95	8
Melbourne House Glebe Cottage Glebe House Station Road Cheddington Leighton Buzzard Beds LU7 7NA	*Hungry Horace*	£5.95	8
Quicksilva Palmerston Park House 13 Palmerston Road Southampton SO1 1LL	*Quintic Warrior*	£7.95	5
Merlin Software Business & Technology Centre Bessemer Drive Stevenage Hertfordshire SG1 2DX	*Crazy Caveman*	£6.50	6
Supersoft Winchester House Canning Road Wealdstone Harrow Middlesex HA3 7SJ	*Stix*	£8.95	10

Round the circuit

***Roy Masefield** presents a program to help select the optimum operating point for transistors*

Anyone who has had to design electronic circuits using transistors will have come up against the problem of selecting the best operating point for the transistor. The correct point is of particular importance when designing small-signal voltage amplifiers. While the use of integrated circuits has reduced the need for single transistors in a lot of applications there are still many cases which call for the use of individual transistors.

Briefly, and to bring us all up to date on theory, let's see what conditions must be met to keep the transistor happy. Figure 1 shows an n-p-n transistor with the essential direct current (dc) potential differences (pd) and currents indicated. V_{CE} is the collector to emitter pd and has to be large enough to maintain the required collector current I_C. V_{CB} is the collector to base pd, which must always be such as to reverse bias the base-collector diode junction. In the case of an n-p-n transistor, this means that the base must be at a lower potential than the collector — for a p-n-p transistor, the base must be higher.

V_{BE} is the base to emitter pd and must be such as to forward bias the base-emitter diode junction, ie, at a higher pd for n-p-n and lower for p-n-p. I_C, I_B and I_E are the collector, base and emitter currents respectively. Without going into transistor theory, it will suffice to say that small changes in base current can produce larger changes in collector current, and it is because of this that the transistor can be used as an amplifier.

Now, suitable values of V_{CE}, I_C and I_B can be found from the transistor manufacturer's literature, either from the tabulated data or from the characteristic curves. Figure 2 shows a typical set of collector characteristics. On this, collector current is plotted against collector-emitter pd for several different values of base current. We might choose as our quiescent operating point (ie, with no applied signal) some central point like Q. This establishes V_{CE}, I_C and I_B.

What we have to find out are the values of the components we shall need in the outside circuitry to give these operating conditions. Figure 3 shows a simple circuit for this.

R_1 and R_2 form a potential divider to provide the base bias. R_3 is the collector load across which the output signal voltage is developed. R_4 is a stabilising resistor to prevent thermal runaway, and it is usually heavily decoupled by a large electrolytic capacitor *C* so that at alternating current (ac) signal frequencies R_4 is virtually shorted out. This capacitor has no effect on the dc.

Quite simple formulae can now be used to find the values of the four resistors, if we make one or two assumptions.

(1) The current in the potential divider, I_P, is usually taken to be at least 10 times the base current, I_B, so as to have a swamping effect.
(2) V_E is usually only a volt or so.
(3) The supply voltage, V_{BB}, is taken as $V_{CE} + V_E$.
(4) If V_{BE} cannot be found from the manufacturer's data, a good estimate is 0.6V for a silicon transistor, or 0.3V for germanium.

The formulae, all relying only on Ohm's Law, are

$$R_1 = \frac{V_{BB} - (V_{BE} + V_E)}{I_P} \qquad R_2 = \frac{V_{BE} + V_E}{I_P - I_B}$$

$$R_3 = \frac{V_{BB} - (V_{CE} + V_E)}{I_C} \qquad R_4 = \frac{V_E}{I_C + I_B}$$

Having worked out these values, it is now possible to check if the amplifier will give the desired results — load lines can be drawn, input and output impedances estimated, amplification and power dissipation checked. If they don't come up to specifications, then it may be the operating point must be re-sited. It is here that the short accompanying computer program comes in useful, since it will do this donkey-work so that several different operating points can be tried out quickly.

On Run, you will be asked for V_{CE}, I_C, I_B and V_{BE}. The printout will be R_1, R_2, R_3 and R_4, together with the power rating suitable for each resistor. This is not, please note, the actual power dissipated.

The program is written for the Sinclair Spectrum, but as no gimmicks are used it will translate for other machines very easily.

A final word of caution — don't expect your transistor to behave exactly according to the calculations. Individual transistors may vary from the published characteristics by quite a large amount. All you can expect is a reasonable guide to the circuit values needed for correct bias. Some adjustment may be necessary once you get down to the actual construction. ■

Fig. 1

Fig. 2

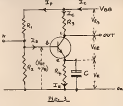


Fig. 3

```
   5 REM TRANSISTOR OPERATING PO
INT
   5 REM © W.R.Masefield 1983
  10 PRINT TAB 3,"TRANSISTOR OPE
RATING POINT": PRINT
  20 PRINT "Select operating poi
nt on trans-istor Collector char
acteristics and, if possible, fi
```

```
nd Base-     Emitter potential di
fference     (Vbe) from transisto
r data. If   Vbe is not given, ta
ke it to be  0.6V for a silicon s
mall-signal  transistor, and 0.3V
 for ger-    manium. A typical va
lue for      Emitter-Ground p.d.
(Ve) is 1V.       Enter values as
prompted     below. NOTE UNITS'"
  30 INPUT "Collector-Emitter p.
d? (Volts)   ",vce,,"Collector Cu
rrent? (milli-Amps) ";ic,,"Base
Current? (micro-Amps)       ",ib,
,"Base-Emitter p.d? (Volts)",vbe
,"Emitter-Ground p.d? (Volts)",v
e
  40 CLS   PRINT TAB 3,"TRANSIST
OR OPERATING POINT". PRINT
  50 PRINT "Collector-Emitter p.
d  ",vce,TAB 31,"V"
  60 PRINT TAB 4,"Collector curr
ent  ",ic,TAB 30,"mA"
  70 PRINT TAB 9,"Base      ,,
",ib,TAB 30,"uA"
  80 PRINT TAB 5,"Base-Emitter p
.d  ",vbe,TAB 31,"V"
  90 PRINT TAB 3,"Emitter-Ground
p.d  ",ve,TAB 31,"V"
 100 LET ib=ib/1000  LET ip=10*i
b  LET vp=vbe+ve  LET vbb=2*vce+
ve  LET it=ic+ip
 110 LET r1=(vbb-vp)/ip  LET r1=
INT (r1/.001+.5)
 120 LET r2=vp/(ip-ib)  LET r2=I
NT (r2/.001+.5)
 130 LET r3=(vbb-vce-ve)/ic  LET
r3=INT (r3/.001+.5)
 140 LET r4=ve/(ic+ib). LET r4=I
NT (r4/.001+.5)
 150 LET p=(vbb-vp)*ip/1000  GO
SUB 300  LET a$=p$
 160 LET p=vp*(ip-ib)/1000  GO S
UB 300  LET b$=p$
 170 LET p=(vbb-vce-ve)*ic/1000
 GO SUB 300  LET c$=p$
 180 LET p=ve*(ic+ib)/1000  GO S
UB 300  LET d$=p$
 190 PRINT   PRINT "Resistor  Va
lue (ohms)  Rating"
 200 PRINT TAB 3,"R1",TAB 16-LEN
STR$ r1,r1,TAB 24,a$
 210 PRINT TAB 3,"R2",TAB 16-LEN
STR$ r2,r2,TAB 24,b$
 220 PRINT TAB 3,"R3",TAB 16-LEN
STR$ r3,r3,TAB 24,c$
 230 PRINT TAB 3,"R4",TAB 16-LEN
STR$ r4,r4,TAB 24,d$
 240 PRINT   PRINT "Power Supply
 ",vbb,"  V @ ",it," mA"
 250 PRINT AT 21,0;"Press n for
new run, s to stop"
 260 IF INKEY$="" THEN GO TO 260
 270 IF INKEY$="n" THEN GO TO 10
 280 STOP
 300 REM Power Rating SBR
 310 IF p<=0.125 THEN LET p$="0.
125 W"  RETURN
 320 IF p<=0.20 THEN LET p$="0.2
0  W"  AETURN
 328 IF p<=0.25 THEN LET p$="0.2
5  W"  RETURN
 330 IF p<=0.5 THEN LET p$="0.5
 W"  RETURN
 340 IF p<=1 THEN LET p$="1
W"  RETUAN
 350 IF p<=2.5 THEN LET p$="2.5
 W"  RETURN
 360 IF p<=5 THEN LET p$="5     W
"  9ETURN
 370 IF p>5 THEN LET p$=STR$ INT
(p+.5)+" W"  RETURN
```

A manipulative art

***Trevor Toms** unravels some of the mysteries of screen manipulation in the fourth of a six part series*

This week's missive is in the gentle art of screen manipulation — how to print characters, draw lines, plot points, detect screen data — there's a lot to cover and little space so off we go!

The Rom can be used quite easily with most of the normal requirements and, since there are 1001 books available which give the idiosyncratic format of the Spectrum screen map I have avoided repetition and skipped over it in these articles

When printing normal text characters, the best approach to adopt is to use the *Rst 10h* facility in the Rom For newcomers *Rst 10h* is a single-byte Z80 instruction which is equivalent to *Call 10h* In the Spectrum this command has the effect of transferring the character held in register *A* to the currently selected output device

In most cases this would be the screen but there is no reason why you cannot open a stream to any output device (the bottom two lines of display or a Microdrive file or RS232) and output data to a device of your choosing For this reason, you must always indicate to the Rom which device is to be used by calling a routine at address *1601h* Register *A* must contain the stream number to be selected Note that this does not open a stream, merely directs all subsequent output data to that stream, eg to direct output to the screen

```
LD A 2          ;device number 2—screen
CALL SELDEV     ROM routine at 1601h
```

Other devices are

```
0 & 1     Bottom two lines of the screen
2         Main display screen
3         ZX printer
4—15      Any stream opened by Basic OPEN #
```

So, in order to print *ABC* on the screen you would code

```
LD    A,2
CALL  SELDEV
LD    A,41h
RST   10h
LD    A,42h
RST   10h
LD    A,43h
RST   10h
```

How about moving the print position? Easy Any of the control codes listed in the Sinclair handbook (appendix A) can be sent to the screen and will act as shown in that list Tokens will be expanded into their full form and unused characters (eg, codes 0-5) will be printed as a question mark If you want to print at line 4 column 27, you would write

```
LD A 22       ;"AT" control character
RST 10h
LD A 4        ;row number
RST 10h
LD A 27       ;column number
RST 10h
```

This feature holds equally for attribute control characters as well so you are able to alter the inverse bright flash, over and colour attributes at will

However writing long chains of *Ld A,nnnn/Rst 10h* in a program becomes extremely tiresome and you begin to feel that there must be an easier method of coding your instructions to a brand new *Star Trek* game than this! Fret not, because a routine at address *203Ch* will print a complete string provided you have set register pair *De* to hold the address of the first character in the string and *BC* to hold the length

Listing 1 contains three routines one of which, *Print$string* shows the way you can easily include this Rom routine in your own programs with the aid of a small subroutine In most cases, strings are never longer than 255 characters so *Print$string* assumes that your data string includes an initial 'length count' character which is a single byte It's not too difficult to alter this to allow for a 16 bit string length but I would only do it if necessary since it forces every string to waste one byte if not needed

You can then print an entire string by writing

```
LD HL HEADING        ;string address
CALL PRINT$STRING    ;see listing 1


HEADING
DEFB 12              ;print 12 characters
DEFM Introduction    ;the text to be printed
```

On to points and lines Points are especially easy — a single Rom routine at address *22E5h* will plot the point whose co-ordinates are given in the *Bc* register pair — register *B* holds the *Y*-co-ordinate, while *C* holds the *X*-co-ordinate Coordinates follow the standard convention of 0-255 in the *x*-direction and 0-175 in the *y*-direction with (0 0) set at the bottom left-hand corner of the screen

As an exercise you may like to write yourself a "point plotting" subroutine similar to the "string printing" subroutine given in listing 1 This makes it quite easy to include shape drawings in programs

Lines are slightly more complicated since all drawing is relative to the last point plotted I have given a second routine in

continued on page 23

Listing 1

```
$Addr Hex      Op   Operands

F800           UDG:
F800             EQU  23675
F800           DRAW:
F800             EQU  24BAH
F800           XPRINT:
F800             EQU  203CH
F800           UDG$DEFINE:
F800 7E          LD   A,(HL)
F801 23          INC  HL
F802 EB          EX   DE,HL
F803 E61F        AND  1FH
F805 3D          DEC  A
F806 D8          RET  C
F807 FE15        CP   21
F809 D0          RET  NC
F80A 87          ADD  A,A
F80B 87          ADD  A,A
F80C 87          ADD  A,A
F80D 4F          LD   C,A
F80E 0600        LD   B,0
F810 2A7B5C      LD   HL,(UDG)
F813 09          ADD  HL,BC
F814 EB          EX   DE,HL
F815 010800      LD   BC,8
F818 EDB0        LDIR
F81A C9          RET
F81B           DRAW$LINE:
F81B 4D          LD   C,L
F81C 7C          LD   A,H
F81D EB          EX   DE,HL
F81E 1E01        LD   E,1
F820 07          RLCA
F821 3000        JR   NC,DRAWB
F823 1EFF        LD   E,-1
F825 79          LD   A,C
F826 ED44        NEG
F828 4F          LD   C,A
F829           DRAWB:
F829 1601        LD   D,1
F82B 45          LD   B,L
F82C 7C          LD   A,H
F82D 07          RLCA
F82E 3000        JR   NE,DRAWC
F830 16FF        LD   D,-1
F832 78          LD   A,B
F833 ED44        NEG
F835 47          LD   B,A
F836           DRAWC:
F836 D9          EXX
F837 E5          PUSH HL
F838 D9          EXX
F839 CDBA24      CALL DRAW
F83C D9          EXX
F83D E1          POP  HL
F83E D9          EXX
F83F C9          RET
F840           PRINT$STRING:
F840 4E          LD   C,(HL)
F841 0600        LD   B,0
F843 23          INC  HL
F844 EB          EX   DE,HL
F845 CD3C20      CALL XPRINT
F848 C9          RET
Symbols:
UDG     5C7B    DRAW    24BA
XPRINT  203C    UDG$DE  F800
DRAW$L  F81B    DRAWB   F829
DRAWC   F836    PRINT$  F840

No error(s)
```

listing 1 which makes the task slightly easier inasmuch as it conforms to the register conventions I have stuck to throughout. The subroutine is entitled *Draw$line* and it requires registers *Hl* to hold the *x*-increment and *De* to hold the *y*-increment. Both register pairs are assumed to be signed 16-bit values. The subroutine itself merely converts these values into a form suitable for a Rom routine at address *24BAh*.

The last routine this week, also given in listing 1, is a small subroutine that allows you to define a single graphic character from machine code. The routine *Udg$define* requires a parameter in registers *Hl* which point to a nine-byte string. The first character of this string should be the Ascii code value of the key to be defined while the remaining eight bytes hold the individual row values of the character.

Next week, we'll finish off the display features by taking a look at colour and how to alter the global settings of attributes (over, inverse, flash etc) along with a couple of useful special effects.

In the meantime, listing 2 gives you a small program that uses some of the features covered this week. It draws a line border around the screen, defines *Udg* letter *A*, then moves the character around the screen within the box depending on pressing keys 5-8. Fairly unexciting, but it does demonstrate the ease of coding when using a set of pre-defined subroutines.

The routine *Draw$image* can be easily used while *Set$string* is an example of how moving graphics can be implemented with user graphics. The code that follows the call to *Await$key* in the main loop is intended to determine which key is pressed, then to update the current screen position depending on the appropriate key value. Table *Kcodes* holds the increment data for each key, and a check is made to ensure the resulting position is still within screen limits (ie, it never touches the border line). ■

By Trevor Toms, author of The Spectrum Pocket Book, published by Phipps Associates

Listing 2

```
Addr Hex       Op    Operands

F000           XPLOT:
F000            EQU  22E5H
F000           SELDEV:
F000            EQU  1601H
F000           AWAIT$KEY:
F000            EQU  15D4H
F000           BREAK$TST:
F000            EQU  1F54H
F000           DRAW$LINE:
F000            EQU  0FB1BH
F000           UDG$DEFINE:
F000            EQU  0FB00H
F000           PRINT$STR:
F000            EQU  0FB40H
F000           BEGIN:
F000 010000     LD   BC,0
F003 CDE522     CALL XPLOT
F006*210000     LD   HL,SQUARE
F009*CD0000     CALL DRAW$IMAGE
F00C*210000     LD   HL,KEYA
F00F CD00F8     CALL UDG$DEFINE
F012 210A0A     LD   HL,0A0AH
F015*220000     LD   (SPOS),HL
F018           LOOP:
F018 3E90       LD   A,144
F01A*CD0000     CALL SET$STRING
F01D CD541F     CALL BREAK$TST
F020 D0         RET  NC
F021 3E01       LD   A,1
F023 CD0116     CALL SELDEV
F026 CDD415     CALL AWAIT$KEY
F029 D635       SUB  35H
F02B 38EB       JR   C,LOOP
F02D FE04       CP   4
F02F 30E7       JR   NC,LOOP
F031 F5         PUSH AF
F032 3E20       LD   A,32
F034*CD0000     CALL SET$STRING
F037 F1         POP  AF
F038 5F         LD   E,A
F039 1600       LD   D,0
F03B*210000     LD   HL,KCODES
F03E 19         ADD  HL,DE
F03F 19         ADD  HL,DE
F040*110000     LD   DE,SPOS
F043 1A         LD   A,(DE)
F044 86         ADD  A,(HL)
F045 FE01       CP   1
F047 38CF       JR   C,LOOP
F049 FE15       CP   21
F04B 30CB       JR   NC,LOOP
F04D 12         LD   (DE),A
F04E 13         INC  DE
F04F 23         INC  HL
F050 1A         LD   A,(DE)
F051 86         ADD  A,(HL)
F052 FE01       CP   1
F054 38C2       JR   C,LOOP
F056 FE1F       CP   31
F058 30BE       JR   NC,LOOP
F05A 12         LD   (DE),A
F05B 18BB       JR   LOOP
F05D           SET$STRING:
F05D*320000     LD   (CHAR),A
F060 3E02       LD   A,2
F062 CD0116     CALL SELDEV
F065*210000     LD   HL,STRING
F068 CD40FB     CALL PRINT$STR
F06B C9         RET
F06C           DRAW$IMAGE:
F06C 5E         LD   E,(HL)
F06D 23         INC  HL
F06E 56         LD   D,(HL)
F06F 23         INC  HL
F070 D5         PUSH DE
F071 5E         LD   E,(HL)
F072 23         INC  HL
F073 56         LD   D,(HL)
F074 23         INC  HL
F075 E3         EX   (SP),HL
F076 7A         LD   A,D
F077 B3         OR   E
F078 B4         OR   H
F079 B5         OR   L
F07A*2800       JR   Z,DRAWX
F07C CD1BFB     CALL DRAW$LINE
F07F E1         POP  HL
F080 18EA       JR   DRAW$IMAGE
F082           DRAWX:
F082 E1         POP  HL
F083 C9         RET
F084           STRING:
F084 04         DEFB 4
F085 16         DEFB 22
F086           SPOS:
F086 0000       DEFW 0
F088           CHAR:
F088 00         DEFB 0
F089           KEYA:
F089 41         DEFB 65
F08A 18         DEFB 24
F08B 3C         DEFB 60
F08C 5E         DEFB 94
F08D FF         DEFB 255
F08E FF         DEFB 255
F08F 5E         DEFB 94
F090 3C         DEFB 60
F091 18         DEFB 24
F092           SQUARE:
F092 FF00       DEFW 255
F094 0000       DEFW 0
F096 0000       DEFW 0
F098 AF00       DEFW 175
F09A 01FF       DEFW -255
F09C 0000       DEFW 0
F09E 0000       DEFW 0
F0A0 51FF       DEFW -175
F0A2 0000       DEFW 0
F0A4 0000       DEFW 0
F0A6           KCODES:
F0A6 00FF       DEFW 0FF00H
F0A8 0100       DEFW 0001H
F0AA FF00       DEFW 00FFH
F0AC 0001       DEFW 0100H
Symbols:
XPLOT   22E5    SELDEV  1601
AWAIT$  15D4    BREAK$  1F54
DRAW$L  FB1B    UDG$DE  FB00
PRINT$  FB40    BEGIN   F000
LOOP    F018    SET$ST  F05D
DRAW$I  F06C    DRAWX   F082
STRING  F084    SPOS    F086
CHAR    F088    KEYA    F089
SQUARE  F092    KCODES  F0A6

No error(s)
```

A message for Santa

Steven and Keith Brain show how to create computer Christmas cards

As the festive season approaches once again, micro users everywhere are rubbing their hands with glee and hoping that Santa will be bringing them the latest game, book or add-on module, or that he might even squeeze a disc drive or printer into his sack. The user must employ desperate tactics to make sure that his dreams are not forgotten. One of the most effective ways of doing this is to send suitably subtle Christmas cards to all of Santa's little helpers.

Now even if you don't need to spend out money on birdseed for Buzby, sending Christmas cards is a very expensive business these days. Of course you could get paper and coloured pencils out and produce some home-made Christmas cards but that's not going to impress anyone, is it? Why not design a series of Christmas cards using the excellent hi-res graphics of the Dragon and save these as machine code files on your humble tape unit.

The main problem is that drawing a Christmas card from scratch in Basic is very time consuming. Graphic designer programs give you a drawing cursor and allow you to access all the hi-res commands directly from the keyboard, but producing a whole series of different designs is still a mammoth task. However, if you look at a lot of Christmas cards you will soon realise that certain objects (like Christmas trees, bells, holly, snow, etc) occur with monotonous regularity, but in different combinations and colours. We have therefore put together the following program which produces pictures of a series of these standard Christmas objects and then allows you to place copies of these anywhere on the screen with a single key press. A text message can be added and the final designs are easily saved to tape or disc.

Notes are included in the program listing but the general format is as follows — first of all, the system is initialised, eight graphics pages cleared and arrays set up to hold the screen areas we will *Get* and the cursor *(Cu)*. The actual routines which form the objects reside from *10000-10160* and we *Get* these into arrays in lines *10170-10250*. *Vk$ (560)* contains a list of valid keys and then the rest of the variables are set up. If no key is pressed the cursor flashes *(1130-1170)*. If a key which has been defined in *Vk$* is pressed, then the appropriate action subroutine is called *(1040)*.

The cursor keys update the screen position, provided that the limits are not exceeded *(1050-1120)*. The functions of the control keys are listed in table 1. *T, P, H* and *B* respectively *Put Pset* the array containing the tree, pudding, holly or bell at the current cursor position. The number keys *1-4* give circular decorations in the four colours, and 5-8 similarly produce stars (snow). As these small objects are *Drawn* rather than being *Put,Pset* they do not affect the background.

* transfers you to text mode, where you can write your messages. *Z* produces a temporary copy of the current screen on the top four graphics pages, and / retrieves this copy. This rubber-banding feature enables you to test the result of a change in your design, without the danger of permanently ruining the whole picture. Shifted keys *1-4* change the size of the cursor movement. *S* saves a machine code dump of the graphics pages onto tape and *L* loads it back. Pressing shift and clear at the same time clears the screen if you have made a mess!

The hi-res text routine which is included simply *Draws* characters. These are defined in line numbers which correspond to the Ascii codes (certain characters have not been included, so you can define your own in these positions — to avoid *Ul* errors, fill any empty lines in this area with *Return)*. Letters and numbers are defined, the cursor keys control your position, and the colour can be changed with shifted keys *1-4* (erase by using the background colour).

To change the angle of the letters, press *Enter* and then a number from *0-3*. The scale used gives 16x12 characters which seems a reasonable size, but if you want to change this alter the value of *S* in line *1420*.

If you save a series of cards on tape, a simple loader program will call them back in turn. There is no need to specify filenames and, as each loads, it will replace the previous picture from the top down.

```
10 PMODE 3 1:SCREEN1 0:PCLS
20 CLOADM
40 GOTO 20
```

If you prefer each card to spring into place instantaneously, you can reserve eight pages, views the top four, and only *Pcopy* from the first four when each load is complete.

```
10  PCLEAR8:PMODE
    3,1:SCREEN1 0:P
    CLS
30  PCOPY 1TO5:PCOPY
    2TO6:PCOPY 3
    TO7:PCOPY 4TO8
```

If your dreams really do come true and you find a disc drive under the Christmas tree (with a blank disc of course) you can modify the program to demonstrate to your relatives the great increase in speed of loading. We have included direct access to the disc directory by pressing *O* (press *C* to continue), so that you can see what filenames you have already used. This routine works on both Delta and Dragondos disc systems.

```
560 VK$="TPHB12345678"Z/I"+CHR$(
    34)+"#SLS"+CHR$(92)+"D"
1040  ON K GOTO 1180,1200,1220,12
      40,1260,1300,1320,1340,1360
      ,1380,1400,1420,1440,1600,1640,1
      580,1660,1570,1680,1620,1650,168
      0
1680 CLS:DIR
1690 A$=INKEY$:IF A$<>"C"THEN 1690
1700 SCREEN 1 0:GOTO 1000
```

The actual *Load/Save* modifications are different for the two systems as the syntax of the commands varies. The Delta version is very simple.

```
1600 LOADM NA$
1640 SAVEM NA$ 1536 7679
```

With Dragondos you need to specify three parameters and it saves a lot of typing later if you automatically add the suffix *.Bin* to your filenames.

```
1590 IF NA$="###" THEN 1000 ELSE
     NA$=NA$+".BIN"
1600 LOAD NA$
1640 SAVE NA$ 1536,7679,1506
```

With disc systems you must specify filenames, but these can easily be read from *Data* statements. As the *Data* is *Restored* when *End* is found, the sequence repeats ad infinitum (is this a good way to test your drive!). This is the Delta version.

```
10 PMODE 3 1:SCREEN 1 0:PCLS
20 DATA       etc        END
30 RESTORE
40 READ NA$
50 IF NA$="END" THEN 30
60 LOADM NA$
70 PCOPY 1TO5:PCOPY 2TO6:PCOPY 3
   TO7:PCOPY 4TO8
90 GOTO 40
```

For Dragondos add *.Bin* again.

```
50 NA$=NA$+".BIN":LOAD NA$
```

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Table 1

SUMMARY OF SINGLE KEY COMMANDS

DRAWING MODE

Key	Command
cursor keys	move cursor in relevant direction
T	Xmas tree
H	holly
P	Xmas pudding
B	bell
1	green circle
2	yellow circle
3	blue circle
4	red circle
5	green star
6	yellow star
7	blue star
8	red star
!	cursor size 1
"	cursor size 2
#	cursor size 3
$	cursor size 4
S	save
L	load
D	directory (disc version only)
clear+shift	clears screen
Z	puts screen in temporary storage
/	retrieves screen from storage
↑	enter text mode

TEXT MODE

Key	Command
alpha-numeric keys	generates characters
cursor keys	move cursor in relevant direction
!	changes to green text
"	changes to yellow text
#	changes to blue text
$	changes to red text
enter followed by key 0-3	changes angle
@	return to graphics mode

Jump to set up

```
10 GOTO 500
```

Text mode key-check and cursor

```
20 C$=INKEY$ PUT(X,Y)-(X+S,Y),CU
,NOT FOR N=1 TO 10 NEXT N PUT(X,
Y)-(X+S,Y),CU,NOT IF C$="" THEN
20 ELSE IF C$="@" THEN RETURN
21 A=ASC(C$) Y=X+((S*2)*((A=8)-(
A=9))) Y=Y+((S*2)*((A=94)-(A=10)
)) IF Y>YE THEN Y=YE ELSE IF Y<Y
S THEN Y=YS
22 IF X>XE THEN X=XE ELSE IF X<X
S THEN X=XS
23 DRAW"BM"+STR$(X)+","+STR$(Y)
IF A=13 THEN 24 ELSEIF A>31 AND
A<91 THEN GOSUB 25 X=X+(S*2) GOT
O 20 ELSE 20
24 D$=INKEY$ SOUND 1,1 IF D$=""
THEN 24 ELSE IF VAL(D$)>3 THEN D
$="" GOTO 20 ELSE 20
25 DRAW"C"+STR$(C1)+"A"+DR+"S"+S
TR$(S) ON(ASC(C$)-31)GOSUB32,33,
34,35,36,37,38,39,40,41,42,43,44
,45,46,47,48,49,50,51,52,53,54,5
5,56,57,58,59,60,61,62,63,64,65,
66,67,68,69,70,71,72,73,74,75,76
,77,78,79,80,81,82,83,84,85,86,8
7,88,89,90 RETURN
```

Space

```
32 DRAW"C3"+"U6R6D6R6U6R6D6BM
+3,+0" RETURN
```

Colour change

```
33 C1=1 RETURN
34 C1=2 RETURN
35 C1=3 RETURN
36 C1=4 RETURN
```

Text characters

(37-47 RETURN)

```
48 DRAW"BM+0,-1F1R2E1U4H1L2G1D4B
M+8,+1" RETURN
49 DRAW"BM+1,+0U6G1BM+6,+5" RETU
RN
50 DRAW"BM+1,+0L4U1E1R2E1U2H1L2G
1BM+8,+5" RETURN
51 DRAW"BM+0,-1F1R2E1U1H1L2R2E1U
1H1L2G1BM+8,+5" RETURN
52 DRAW"BM+3,+0U6G3R4BM+0,+3" RE
TURN
53 DRAW"BM+0,-1F1R2E1U2H1L3U2R4B
M+4,+6" RETURN
54 DRAW"BM+0,-2E1R2F1D1G1L2H1U4E
1R2F1BM+4,+5" RETURN
55 DRAW"BM+2,+0U2E2U2L4BM+8,+6"
RETURN
56 DRAW"BM+1,+0R2E1U1H1L2H1U1E1R
2F1D1G1L2G1D1F1BM+7,+0" RETURN
57 DRAW"BM+0,-1F1R2E1U4H1L2G1D1F
1R3BM+4,+3" RETURN
```

(58-64 RETURN)

```
65 DRAW"U5E1R2F1D5U3L4BM+8,+3" R
ETURN
66 DRAW"U6R3F1D1G1F1D1G1L3U3R3BM
+5,+3" RETURN
67 DRAW"BM+1,+0H1U4E1R2F1BM1L2G1D
4F1R2E1BM+4,+1" RETURN
68 DRAW"U6R3F1D4G1L3BM+8,+0" RET
URN
69 DRAW"R4L4U3R4L4U3R4BM+4,+6" R
ETURN
70 DRAW"U3R4L4U3R4BM+4,+6" RETUR
N
71 DRAW"BM+1,+0R2E1U1L1R1D1G1L2H
1U4E1R2F1BM+4,+5" RETURN
72 DRAW"U6D3R4U3D6BM+4,+0" RETUR
N
73 DRAW"BM+1,+0R2L1U6L1R2BM+4,+6
" RETURN
74 DRAW"BM+0,-1F1R2E1U5BM+4,+6"
RETURN
75 DRAW"U6BM+0,+3R1E3G3F3BM+4,+0
" RETURN
76 DRAW"R4L4U6BM+8,+6" RETURN
77 DRAW"U6F2E2D6BM+4,+0" RETURN
78 DRAW"U6D1F4D1U6BM+4,+6" RETUR
N
79 DRAW"BM+1,+0R2E1U4H1L2G1D4F1B
M+7,+0" RETURN
80 DRAW"U6R3F1D1G1L3BM+8,+3" RET
URN
81 DRAW"BM+1,+0R2E1U4H1L2G1D4F1B
M+1,-2F2BM+4,+0" RETURN
82 DRAW"U6R3F1D1G1L3R1F3BM+4,+0"
RETURN
83 DRAW"BM+0,-1F1R2E1H4E1R2F1BM+
4,+5" RETURN
84 DRAW"BM+2,+0U6L2R4BM+4,+6" RE
TURN
85 DRAW"BM+0,-6D5F1R2E1U5BM+4,+6
" RETURN
86 DRAW"BM+0,-6D4F2E2U4BM+4,+6"
RETURN
87 DRAW"BM+0,-6D6E2F2U6BM+4,+6"
RETURN
88 DRAW"U1E4U1BM+0,+6U1H4U1BM+8,
+6" RETURN
89 DRAW"BM+2,+0U4H2F2E2BM+4,+6"
RETURN
90 DRAW"R4L4U1E4U1L4BM+8,+6" RET
URN
```

Set up routine

```
500 PCLEAR5 DIMT(110)
510 DIMP(130)
520 DIM H(40)
530 DIM B(30)
540 DIM CU(5)
550 GOSUB 10000
```

Continued on page 27



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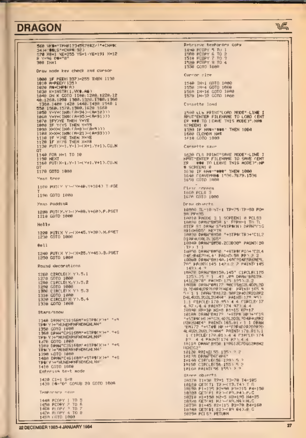
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```
560 VK$="TPH012345678*Z/!"+CHR$(
34)+"@$LS"+CHR$(92)
570 XS=1 XE=255 YS=1:YE=191 X=12
8 Y=96 D$="8"
580 IN=1
```

Draw mode key check and cursor

```
1000 IF PEEK(337)=255 THEN 1130
1010 A=PEEK(135)
1020 A$=CHR$(A)
1030 K=INSTR(1,VK$,A$)
1040 ON K GOTO 1180,1200,1220,12
40,1260,1280,1300,1320,1380,1360
,1380,1400,1420,1440,1490,1540,1
550,1560,1570,1580,1620,1660
1050 Y=Y+(IN*((A=94)-(A=10)))
1060 Y=Y+(IN*((A=95)-(A=91)))
1070 IFY>YE THEN Y=YE
1080 IF Y<YS THEN Y=YS
1090 X=X+(IN*((A=8)-(A=9)))
1100 X=X+(IN*((A=21)-(A=93)))
1110 IF X>XE THEN X=XE
1120 IF X<XS THEN X=XS
1130 PUT(X-1,Y-1)-(X+1,Y+1),CU,N
OT
1140 FOR N=1 TO 10
1150 NEXT
1160 PUT(X-1,Y-1)-(X+1,Y+1),CU,N
OT
1170 GOTO 1000
```

Xmas tree

```
1180 PUT(X,Y)-(X+40,Y+104),T,PSE
T
1190 GOTO 1000
```

Xmas pudding

```
1200 PUT(X,Y)-(X+80,Y+60),P,PSET
1210 GOTO 1000
```

Holly

```
1220 PUT(X,Y)-(X+45,Y+30),H,PSET
1230 GOTO 1000
```

Bell

```
1240 PUT(X,Y)-(X+25,Y+45),B,PSET
1250 GOTO 1000
```

Round decorations

```
1260 CIRCLE(X,Y),5,1
1270 GOTO 1000
1280 CIRCLE(X,Y),5,2
1290 GOTO 1000
1300 CIRCLE(X,Y),5,3
1310 GOTO 1000
1320 CIRCLE(X,Y),5,4
1330 GOTO 1000
```

Stars/snow

```
1340 DRAW"C1S16BM"+STR$(X)+","+S
TR$(Y)+"NUNENRNFNDNGNLNH"
1350 GOTO 1000
1360 DRAW"C2S16BM"+STR$(X)+","+S
TR$(Y)+"NUNENRNFNDNGNLNH"
1370 GOTO 1000
1380 DRAW"C3S16BM"+STR$(X)+","+S
TR$(Y)+"NUNENRNFNDNGNLNH"
1390 GOTO 1000
1400 DRAW"C4S16BM"+STR$(X)+","+S
TR$(Y)+"NUNENRNFNDNGNLNH"
1410 GOTO 1000
```

Entering text mode

```
1420 C1=1 S=8
1430 D$="D" GOSUB 20 GOTO 1000
```

Temporary save

```
1440 PCOPY 1 TO 5
1450 PCOPY 2 TO 6
1460 PCOPY 3 TO 7
1470 PCOPY 4 TO 8
1480 GOTO 1000
```

Retrieve temporary copy

```
1490 PCOPY 5 TO 1
1500 PCOPY 6 TO 2
1510 PCOPY 7 TO 3
1520 PCOPY 8 TO 4
1530 GOTO 1000
```

Cursor size

```
1540 IN=1 GOTO 1000
1550 IN=4 GOTO 1000
1560 IN=16 GOTO 1000
1570 IN=32 GOTO 1000
```

Cassette load

```
1580 CLS PRINT"LOAD MODE" LINE I
NPUT"ENTER FILENAME TO LOAD (ENT
ER ### TO LEAVE THIS MODE)";NA$
SCREEN1 0
1590 IF NA$="###" THEN 1004
1600 CLOADM NA$
1610 GOTO 1000
```

Cassette save

```
1620 CLS PRINT"SAVE MODE":LINE I
NPUT"ENTER FILENAME TO SAVE (ENT
ER  ### TO LEAVE THIS MODE)";NA
$ SCREEN1 0
1630 IF NA$="###" THEN 1000
1640 CSAVEMNA$ 1536,7679,1536
1650 GOTO 1000
```

Clear screen

```
1660 PCLS 3
1670 GOTO 1000
```

Draw objects

```
10000 TL=10 ST=1 TR=75:TP=80 PO=
50 PP=95
10010 PMODE 3 1 SCREEN1 0 PCLS3
10020 DRAW"BM50 1" FORN=1 TO TL
STEP ST DRAW"S"+STR$(N) DRAW"C1G
8R16H8D5" NEXTN
10030 DRAW"BM50 "+STR$(TR)+"C1L2
D10R4U10L2L3D5"
10040 DRAW"BM50,2C3D30" PAINT(50
,TP),1 1
10050 DRAW"BM50 "+STR$(PO)+"C2L4
D4F R4E2U4L4" PAINT(50 PP) 2 2
10060 DRAW"BM140,140C2S4F5R6AE5L
70" PAINT(145 142) 2 2 PAINT(145
 142) 4 2
10070 DRAW"BM150,145" CIRCLE(175
 125),35 2 1 .43 ,0 DRAW"BM139,
141C2R70" PAINT(175 125) 2 2
10080 DRAW"BM172 90C1S8G2L4D2L2D
2L2D4R4U2R2U2R2U4E4" PAINT(165 9
5) 1 1 DRAW"BM172 90F2R4D2R2D2R2
D4L4U2L2U2L2U4H4" PAINT 170 95)
1 1 CIRCLE(170 95) 4 4 CIRCLE(17
4 97),4 4 PAINT(174 97) 4 4
10090 HP=10 HS=8 B1=15 B2=17
10100 DRAW"BM172 "+STR$ HP)+"C1S
"+STR$(HS)+"G2L4D2L2D2L2D4R4U2R2
U2R2U4E4" PAINT(165,81) 1 1 DRAW
"BM172 "+STR$ HP)+"F2R4D2R2D2R2D
4L4U2L2U2L2U4H4" PAINT(178 81),1
 1 CIRCLE(170 81) 4 4 CIRCLE(174
 82) 4 4 PAINT(174 82) 4 4
10110 DRAW"BM50 120G12C2D6G2R8H2
UGH2G2"
10120 PAINT(55 135) 2 2
10130 DRAW"D6C4R4"
10140 CIRCLE(56 120) 5 2
10150 CIRCLE(56 155) 5 2
10160 PAINT(56 155) 2 2
```

Store objects

```
10170 T1=30 T2=1 T3=70 T4=105
10180 GET(T1 T2)-(T3,T4) T G
10190 P1=125 P2=90 P3=215 P4=150
10200 GET(P1 P2)-(P3,P4) P,G
10210 H1=150 H2=5 H3=195 H4=35
10220 GET(H1 H2)-(H3,H4) H,G
10230 B1=45 B2=115 B3=70 B4=160
10240 GET(B1 B2)-(B3 B4),B G
10250 PCLS2 RETURN
```

Programming by angles

***Czes Kosniloski** concludes his demonstration of trigonometry in programming*

Non right-angled triangles

The first two examples from the scale drawing section may be solved by using the Right-Angled Triangles program. The third example (usually) involves non right-angled triangles.

A triangle has three angles and three sides. If we know the values of any three of these (except three angles) then we can find the values of the other three. For example, we might know the length of two sides and one angle. We can then find the length of the third side and the value of the other two angles. To do this we use a formula.

Let's call the three angles in our triangle X, Y and Z, the three sides SX, SY and SZ where side SX is opposite angle X, etc (see Figure 10).

Figure 10

The following formulae relate the various sides and angles.

The law of cosines

$$SZ*SZ = SX*SX + SY*SY - 2*SX*SY*COS(Z)$$
$$SY*SY = SX*SX + SZ*SZ - 2*SX*SZ*COS(Y)$$
$$SX*SX = SY*SY + SZ*SZ - 2*SY*SZ*COS(X)$$

The law of sines:

$$SIN(X)/SX = SIN(Y)/SY = SIN(Z)/SZ$$

Notice that if Z is a right-angle (that is 90°) then *Cos(Z) = 0* and so the first formula becomes

$$SZ*SZ = SX*SX + SY*SY$$

which is just Pythagoras theorem.

Program 2 will find the remaining angles and sides provided you know one of the following:

Side Side Side: You know all three sides and are looking for the measurements of the three angles.

Side Side Angle: You know two sides and an angle which is not between them (a non-inclusive angle) and you are looking for the other side and angles.

Side Angle Side: You know two sides and the angle between them (the inclusive angle) and you are looking for the other side and angles.

Side Angle Angle: You know two angles and a side which is not between them (a non-inclusive side) and you are looking for the other two sides and the third angle.

Angle Side Angle: You know two angles and the side between them (the inclusive side) and you are looking for the other two sides and the third angles.

Notice that in the second case (Side Side Angle) two different triangles are (usually) possible depending on whether the angle opposite side 3 is greater than or less than 90°. See Figure 11 which illustrates this point.

Figure 11

Refraction

Things often look distorted when viewed through glass or plastic. Water looks shallower than it actually is. The reason is refraction. When a ray of light travels from one medium (air) to another (glass, water) it is bent or refracted. The angle that the ray hits the glass with is called the angle of incidence, the angle after it has been refracted is called the angle of refraction (Figure 12).

Figure 12

For a given material there is a fixed relation between the angles of incidence and refraction. This is given by Snell's law which states that the ratio of the sine is constant for any material (in air). This ratio is called the refractive index.

$$\text{refractive index} = \frac{\text{SIN(angle of incidence)}}{\text{SIN(angle of refraction)}}$$

For glass the refractive index is about 1.5, for water it is 1.333, while for diamond it is 2.417.

Program 3 allows you to determine the angle of refraction, assuming that you know the angle of incidence and the refractive index.

Reflection

A piece of glass or the surface of water occasionally behaves like an ordinary mirror, reflecting everything. This occurs when the angle of incidence is too great and the ray of light is reflected. The smallest angle at which this occurs is called the critical angle of the medium. This is given by the following simple formula

$$\text{SIN(critical angle)} = \frac{1}{\text{refractive index}}$$

Thus the critical angle can be determined from the refractive index by using the *Asn* function described earlier on. ■

This is an extract from Mathematics on the Commodore 64 by Czes Kosniowski published by Sunshine Books

Program 2

```
10 REM TRIANGLES
20 PRINT CHR$(147)."    TRIANGLES" CHR$(
17)
30 PRINT "THIS PROGRAM WILL FIND THE REM
AINING"
40 PRINT "SIDES AND ANGLES OF A TRIANGLE
." CHR$(17)
50 PRINT "WHICH INFORMATION DO YOU HAVE?
" CHR$(17)
60 PRINT "1> SSS : ALL 3 SIDES" CHR$(17)
70 PRINT "2> SSA : 2 SIDES AND NON-INCLU
SIVE ANGLE"
80 PRINT "3> SAS : 2 SIDES AND INCLUSIVE
 ANGLE" CHR$(17)
90 PRINT "4> SAA : 2 ANGLES AND NON-INCL
USIVE SIDE"
100 PRINT "5> ASA : 2 ANGLES AND INCLUSI
VE SIDE" CHR$(17)
110 REM MAKE SELECTION
120 INPUT "TYPE IN NUMBER "; N
130 IF N<1 OR N>5 OR N<>INT(N) THEN PRIN
T,"TRY 1, 2, 3, 4 OR 5.":GOTO 120
140 REM DEFINE ARCSINE FUNCTION, IN DEGR
EES TO 2 DECIMAL PLACES
150 DEF FNAS(X) = INT(18000*ATN(X/SQR(1-
X*X)) + .5)/100
160 REM SPLIT OFF
170 PRINT:ON N GOSUB 310,510,710,910,101
0
180 PRINT CHR$(17),"ANOTHER GO? Y OR N"
190 GET G$:IF G$<>"Y" AND G$<>"N" THEN 1
90
200 IF G$="Y" THEN RUN
210 PRINT CHR$(147) "BYE FOR NOW.":END
300 REM ALL 3 SIDES
310 PRINT "*** ALL 3 SIDES KNOWN ***" CH
```

```
R$(17)
320 M=1:GOSUB 1110:SX=S
330 M=2:GOSUB 1110:SY=S
340 M=3:GOSUB 1110:SZ=S
350 A=(SY*SY+SZ*SZ-SX*SX)/(2*SY*SZ)
360 IF ABS(A)>=1 THEN PRINT "NOT A TRIAN
GLE":RETURN
370 PRINT "ANGLE OPPOSITE SIDE 1 IS " 90
-FNAS(A)
380 A=(SX*SX+SZ*SZ-SY*SY)/(2*SX*SZ)
390 PRINT CHR$(17) "ANGLE OPPOSITE SIDE
2 IS " 90-FNAS(A)
400 A=(SX*SX+SY*SY-SZ*SZ)/(2*SX*SY)
410 PRINT CHR$(17) "ANGLE OPPOSITE SIDE
3 IS " 90-FNAS(A)
420 RETURN
500 REM 2 AIDES AND A NON-INCLUSIVE ANGL
E
510 PRINT "** 2 SIDES AND A NGN-INCLUSIV
E ANGLE ** "
520 PRINT "TYPE IN THE SIDE FOR WHICH TH
E OPPOSITE ANGLE IS KNOWN" CHR$(17)
530 M=1:GOSUB 1110:SX=S:GOSUB 1210:AX=A
540 M=2:GOSUB 1110:SY=S
550 A=SIN(AX)*SY/AX:IF ABS(A)>1 OR A=0 T
HEN PRINT."NOT A TRIANGLE":RETURN
560 PRINT "IS ANGLE OPPOSITE SIDE 2 GREA
TER (>) OR LESS (<) THAN 90 DEGREES?"
570 INPUT "TYPE > OR < ': A$
580 IF A$<>"<" AND A$<>">" THEN 346
590 AY=FNAS(A):IF A$=">" AND AY<90 THEN
AY=90+AY
600 PRINT CHR$(17) "ANGLE OPPOSITE SIDE
2 IS" AY CHR$(17)
610 AZ-AX-AY/180
620 PRINT "LENGTH OF SIDE 3 IS" SX*SIN(A
I)/SIN(AX) CHR$(17)
630 PRINT "ANGLE OPPOSITE SIDE 3 IS" INT
(18000*AZ +.5)/100
640 RETURN
700 REM 2 SIDES AND THE INCLUSIVE ANGLE
710 PRINT "*** 2 SIDES AND THE INCLUSIVE
 ANGLE *** "
720 M=1:GOSUB 1110:SX=S
730 M=2:GOSUB 1110:SY=S
740 M=3:GOSUB 1210:AZ=A
750 SZ=SQR(SX*SX+SY*SY-2*SX*SY*COS(AZ))
760 IF SZ=0 THEN PRINT."NOT A TRIANGLE":
RETURN
770 PRINT "LENGTH OF SIDE 3 IS' SZ CHR$(
17)
780 A=(SY*SY+SZ*SZ-SX*SX)/(2*SY*SZ)
790 PRINT "ANGLE OPPOSITE SIDE 1 IS " 90
-FNAS(A)
800 A=(SX*SX+SZ*SZ-SY*SY)/(2*SX*SZ)
810 PRINT CHR$(17) "ANGLE OPPOSITE SIDE
2 IS " 90-FNAS(A)
820 RETURN
900 REM 2 ANGLES AND A NON-INCLUSIVE SID
E
910 PRINT "** 2 ANGLES AND A NON-INCLUSI
VE SIDE **  "
920 PRINT "TYPE IN THE ANGLE FOR WNICH T
HE OPPOSITESIDE IS KNOWN FIRST" CHR$(17)
930 M=1:GOSUB 1210:AX=A:GOSUB 1110:SX=S
940 M=2:GOSUB 1210:AY=A
950 A-AX-AY:IF A<=0 THEN PRINT."NOT A TR
IANGLE":RETURN
960 PRINT "LENGTH OF SIDE 2 IS " SX*SIN(
AY)/SIN(AX) CHR$(17)
970 PRINT "ANGLE OPPOSITE SIDE 3 IS " IN
T(18000*A + .5)/100 CHR$(17)
980 PRINT "LENGTH OF SIDE 3 IS " SX*SIN(
A)/SIN(AX)
990 RETURN
1000 REM 2 ANGLES AND AN INCLUSIVE SIDE
1010 PRINT "*** 2 ANGLES AND AN INCLUSIV
E SIDE *** ` "
1020 M=1:GOSUB 1210:AX=A
1030 M=2:GOSUB 1210:AY=A
1040 M=3:GOSUB 1110:SZ=S
1050 A-AX-AY:IF A<=0 THEN PRINT."NOT A T
RIANGLE":RETURN
1060 PRINT "ANGLE OPPOSITE SIDE 3 IS " I
NT(18000*A + .5)/100 CHR$(17)
1070 PRINT "LENGTH OF SIDE 1 IS " SZ*SIN
(AX)/SIN(A) CHR$(17)
1080 PRINT "LENGTH OF SIDE 2 IS " SZ*SIN
(AY)/SIN(A)
1090 RETURN
1100 REM GET A SIDE
1110 S=0:PRINT "TYPE LENGTH OF SIDE" M "
: ";:INPUT S:PRINT CHR$(17);
1120 IF S<=0 THEN PRINT."NOT A TRIANGLE'
":GOTO 1110
1130 RETURN
1200 REM GET AN ANGLE
1210 A=0:PRINT "TYPE ANGLE OPPOSITE SIDE
" M ": ";:INPUT A:PRINT CHR$(17):
1220 IF A<=0.001 OR A>=180 THEN PRINT."N
OT A TRIANGLE'":GOTO 1210
1230 A=A/180:RETURN
```

Program 3

```
10 REM REFRACTION PROGRAM
20 PRINT CHR$(147) "             REFRACT
ION" CHR$(17)
30 PRINT "THIS PROGRAM CALCULATES THE AN
GLE OF"
40 PRINT 'REFRACTION WHEN A RAY OF LIGHT
 HITS"
50 PRINT "ANOTHER MEDIUM." CHR$(17)
100 REM INPUT DETAILS
110 PRINT "TYPE IN ANGLE OF INCIDENCE. I
N DEGREES."
120 INPUT "ANGLE: ";X
130 IF X<=0 OR X>=90 THEN PRINT "ERROR -
 NONSENSE':GOTO 120
140 PRINT CHR$(17) "WHAT IS THE REFRACTI
VE INDEX OF THE      MEDIUM?"
145 INPUT "REFRACTIVE INDEX: ";R
150 IF R<=0 THEN PRINT "FUNNY - TRY AGAI
N":GOTO 145
160 REM CONVERT TO RADIANS
170 X=X/180
180 REM CALCULATE
190 Y=SIN(X)/R:Y=Y/SQR(1-Y*Y)
200 PRINT CHR$(17) 'ANGLE OF REFRACTION:
' ATN(Y)*180 "DEGREES."
210 PRINT "PERCENTAGE OF ANGLE OF INCIDE
NCE:" INT(ATN(Y)*100/X)
240 PRINT CHR$(17) "     THAT S IT - ANOT
HER GO Y OR N?"
250 GET G$:IF G$<>"Y" AND G$<>"N" THEN 2
50
260 IF G$="Y" THEN RUN
270 PRINT CHR$(147) "BYE FOR NOW.":END
```

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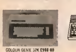

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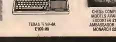

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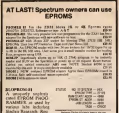
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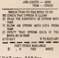
```
STATUS    NO IIF SYSTEM — HEX
            EPROM TYPE — 27128
        RAM START ADDR — 4000
         EPROM ST ADDR — 0000
            JOB LENGTH — 4000
                  TASK — CHECK

     WHICH TASK DO YOU WISH TO DO
W) CHECK THAT EPROM IS CLEAR
X) READ THE CONTENTS OF EPROM INTO
   RAM
Y) BLOW AN EPROM WITH DATA FROM
   RAM
Z) VERIFY THAT EPROM DATA IS THE
   SAME AS IN RAM
Q TO QUIT                R TO RESTART

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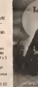
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Character examination

Mike Winson presents e short utility program that uses the features of the BBC's 1 2 operating system

This is a short utility which uses the features of the BBC s particular 1 2 operating system to permit viewing of the byte structure of the internal character set This could have educational uses or could provide a starting point for creating other user-defined characters, eg, different alphabet styles This technique is well documented in the user guide

When Run, the program prompts for a character from the keyboard The character typed will be displayed, in actual size and in large block graphics form, together with its ASCII code, the bytes making up the character (see p 170 of the user guide) are tabulated in decimal and hex alongside the large format character representation

Program notes

- **50** Reserves a 9 byte block of memory for storage of the character code and the 8 bytes making up the character
- **70** Defines character 256 as a block to be used in the printing of the large format character Note the economical use of −1 to represent 244 in 2 s complement notation
- **80 130** Main program loop Waits for a character from the keyboard and calls PROCchar
- **150** Sets X and Y registers to point to the first byte of the block of memory reserved in line 50
- **160** Loads the first location with the character C and calls the OSWORD routine (&FFF1) with A = 10 This stores the bytes making up the character shape in the next 8 locations of the block
- **170-260** Loop to display each byte in binary decimal and hex Note that the binary representation in this program is actually the large block graphics form of the character For true 1 s and 0 s binary representation delete line 70 and replace line 220 by 220 IF W > 255 THEN W − W − 255 VDU 49 ELSEVDU 48
- **250** Prints out the appropriate byte in decimal and in hex. Note that the print in hex symbol has printed as the ASCII overline" symbol on the listing The correct character is found on the BBC micro above the exponentiation arrow

Use with other operating systems

The program was originally written to demonstrate one use of the *Osword* routine in the 1 2 MOS but for those who have not yet upgraded from the version 0 1 then the procedure *Procpatch* can be used to simulate this call This is written specifically as a patch to the main program, so is not the most efficient way of doing things, but if required then delete line 150 and change line 160 to 160 *Procpatch* adding lines 1000-1040 as in Listing 2 ■

Listing 1

```
>L.,997
   10 REm  * * CHARACTER ANALYSER * *
   20 REm          by Mike Winson
   30 REM            April 1983
   40 REM     (for BBC model A or B)
   50 DIMblock%9
   60 MODE1
   70 VDU23,-1,-1,-1,-1,-1,-1,-1,-1,-1
   80 REPEAT
   90 PRINT"Character ?":C=GET
  100 CLS:COLOUR2:PRINT''CHR$C$:COLOUR1
  110 PRINT" = CHR$("$C")   DEC         HEX"':COLOUR3
  120 PROCchar(C)
  130 UNTILFALSE
  140 DEFPROCchar(C)
  150 X%=block%MOD256:Y%=block%DIV256
  160 ?block%=C:A%=10:CALL&FFF1
  170 FORbyte%=1TO8
  180 N=block%?byte%
  190 FORbit=1TO8
  200 COLOUR2
  210 N=N*2
  220 IFN>255THENN=N-255:VDU255ELSEVDU32
  230 NEXTbit
  240 COLOUR3
  250 PRINT,block%?byte%,~block%?byte%
  260 NEXTbyte%
  270 PRINT''"Next ";
  280 ENDPROC
```

Listing 2

```
>L.1000.
 1000 DEFPROCpatch
 1010 FORI=0TO7
 1020 block%?(I+1)=?(&C000+I+8*(C-32))
 1030 NEXTI
 1040 ENDPROC
```


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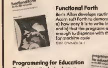


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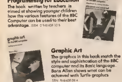


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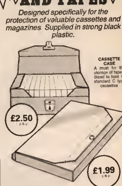
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Bridge

on ZX81

This is a real test of dexterity The program's aim is to prevent the man '*', from falling into the chasm There are six gaps in the bridges which can be filled independently by the player To make things harder a gap cannot be bridged until the man is three spaces away

Should the man reach a gap without a bridge he will fall into the chasm thus ending the game Each time a gap is successfully bridged one point is scored The game has a high-score facility allowing a name comprising six characters to be entered

The screen display is minimal comprising the high-score/score line and three bridges each containing two gaps The man is *Poked* into the display file as this method is quicker than *Printing* onto the screen As the man is the only moving piece the program is quite fast

The instructions from line 1000 onwards give details of which key bridges which gap

Variables

HS =	High Score
H$ =	High-scorer's name
S =	Score
D =	Beginning address of the display file
P =	Position of man
I =	Position of man
A$ =	Holds the bricks of the bridge
I$ =	Used to check the value of INKEY$ and for the INPUT of the high-scorer's name.

Program notes

3	Saves the program thus making it auto-run on LOADing
4	This comprises ten graphic spaces; three spaces six graphic spaces three spaces ten graphic spaces
40	Decides which bridge the man should go across
70-110	Main loop which moves the man across the bridge checks for a key being pressed and checks whether the man has fallen into the chasm
115	Increments score
300-320	Bridging subroutine Previous bridges are wiped out, a check is made to see whether the man is on the bridge and a new bridge is placed (The graphics in line 310 are three graphic shift As)
600-720	Game over routine Invites player to enter name if the previous high-score has been beaten and invites the player to play again
800-840	Makes the man fall down the chasm
1000-1080	Displays the instructions.

```
 0 REM BRIDGE  (C) JUNE 1983
       NEAL BLACKSHIRE
 1 LET HS=0
 2 LET H$="??????"
 3 SAVE "BRIDGE"
 4 LET A$="
 5 SLOW
 7 GOSUB 1000
 10 LET S=0
 15 CLS
 20 LET D=PEEK 16396+256*PEEK 1
6397
 30 PRINT AT 7,0,A$,AT 14,0,A$,
AT 21,0,A$
 40 LET P=D+199+(231 AND RND<.4
)+(462 AND RND>.65)
 50 IF P-D<>199 AND P-D<>430 AN
D P-D<>661 THEN GOTO 40
 60 PRINT AT 0,0,"HSCORE=",HS,T
AB 11," BY ",H$,TAB 22,"SCORE=",
S
 70 FOR I=P TO P+31
 80 POKE I,23
 85 LET I$=INKEY$
 90 IF PEEK (I+33)=0 THEN GOTO
600
 95 IF I$<>"" AND I>P+8 THEN GO
SUB 300
 100 POKE I,0
 110 NEXT I
 115 LET S=S+2
 120 GOTO 40
 300 PRINT AT 7,0,A$,AT 14,0,A$,
AT 21,0,A$
 305 IF PEEK (I+33)=0 THEN GOTO
600
 310 PRINT AT 7+(7 AND (I$="A" O
R I$="L"))+(14 AND (I$="Z" OR I$
="."),10+(9 AND (I$="P" OR I$=
"L" OR I$="."))," 
 320 RETURN
 600 GOSUB 800
 605 IF HS>S THEN GOTO 700
 610 PRINT AT 3,0,"YOU HAVE ",("
BEATEN" AND HS>S),("EQUALLED" AN
D HS=S)," THE HIGH SCORE"
 620 PRINT "ENTER YOUR NAME",,"(
NO LONGER THAN 6 CHARACTERS"
 630 INPUT I$
 640 IF I$="" OR LEN I$>6 THEN G
OTO 630
 650 LET H$=I$
 660 LET HS=S
 670 PRINT AT 0,7,HS,TAB 15,
,AT 0,15,H$
 700 PRINT AT 11,3,"PRESS ""R""
TO START AGAIN"
 705 PRINT AT 10,10,"GAME OVER",
AT 10,10,"
 710 IF INKEY$<>"R" THEN GOTO 70
5
 720 GOTO 10
 800 POKE I,0
 810 LET I=I+33
 820 POKE I,23
 830 IF I-D>693 THEN RETURN
 840 GOTO 800
 1000 POKE 16418,0
 1005 CLS
 1010 PRINT TAB 3,"BRIDGE BY NEAL
 BLACKSHIRE"
 1020 PRINT ,,"THE AIM OF THE GAM
E IS TO STOP THE MAN "*" FALL
ING DOWN THE "," CHASM,YOU DO THIS
 BY FILLING THEGAPS WITH BRIDGES
"
 1030 PRINT AT 7,0,A$,AT 14,0,A$,
AT 21,0,A$
 1040 PRINT AT 7,11,"Q",TAB 20,"P
",AT 14,11,"A",TAB 20,"L",AT 21,
11,"Z",TAB 20,".",AT 22,0,"BRIDG
E A GAP BY PRESSING THE KEYINDIC
ATED ABOVE"
 1045 PAUSE 500
 1050 PRINT AT 10,0,"PRESS ANY KE
Y WHEN YOU ARE READY"
 1060 IF INKEY$="" THEN GOTO 1060
 1070 POKE 16418,2
 1080 RETURN
```

Bridge
by Neal Blackshire

Planet

on Vic20

This program shows you what you can do with a Super Expander on your Vic When run it will draw a picture of a planet in 3D perspective Once you have run it a few times it should be quite easy to add your own features

Line 50 is not necessary and can be omitted All it does is produce the effect of a band of light moving over the planet If the line is kept in by decreasing and increasing the size of the loop you will produce different bands going at different speeds If *Ctrl* is pressed the band changes

```
10 REM 3D-PLANET BY GUY NORTON
20 graphic2:color0,0,1,0:forc=360to0step
   -.4
30 a=c*(1024/360):point1,a*ABS(COS(a/2))
   ,c*a/360:NEXT
40 poke36865,70:poke36864,7
50 poke36879,8:poke36879,25:fort=1to3:NE
   XT:goto50
```

Planet
by Guy Norton


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Tape Seve

on Dragon 32

If you are working on a Basic program you will want to copy it to tape fairly often. If you are sick of pulling plugs out and skipping the plastic leader tape (if any), you will appreciate the following routine. Tacked on to the end of the Basic program it does all the following

1. Makes sure the cassette channel is closed (or *Csave* will fail)
2. Allows you to rewind the tape without pulling plugs out
3. Automatically skips the plastic leader tape (if any)
4. Makes three copies with suffix numbers (FRED 1 FRED 2 etc)

Having added it to your program just type *Run* 5000 and off it goes! If none of your tapes have leaders you can miss lines 5070 5090 but personally I would leave them in for safety

Incidentally there are no jumps or *Gotos*, so line numbers can start anywhere

```
5000 CLOSE # 1
5010 PRINT "REWIND TAPE AND HIT ENTER"
5020 MOTORON  ALLOW REWIND
5030 INPUT X
5040 MOTOROFF
5050 PRINT "PUT TO RECORD (ENTER)"
5060 INPUT X
5070 MOTORON  SKIP LEADER
5080 FOR I = 1 TO 10000 NEXT I
5090 MOTOROFF
5100 FOR K - 1 TO 3 'THREE COPIES
5110 CSAVE "name + STR$(K)  PUT IN NAME'
     OF PROG
5120 NEXT K
5130 PRINT  3 COPIES MADE
5140 END
```

Tape Save
by John Letheren

Large Cherecters

on Spectrum

These routines will produce large characters on the ZX Spectrum — each character being a 3 × 3 grid of graphics characters

The main program should be run initially to set up a number array with the codes of the graphics characters necessary to produce each letter. The routine which prints the characters should be merged into any program requiring the facility together with the line

LOAD LARGECHARS DATA T()

Any word to print must not be more than 10 characters can be either upper or lower case (all output is upper case) and must be loaded into the string Z$ before calling the routine

```
9600 REM ************************
9601 REM * ROUTINE TO PREPARE   *
9602 REM * A NUMBER ARRAY FOR   *
9603 REM * LARGE CHARACTERS     *
9604 REM ************************
9605 REM
9610 DATA 128,128,128,128,128,12
8,128,128,128
9611 DATA 133,136,128,133,136,12
8,138,136,128
9612 DATA 128,136,138,128,128,12
8,128,128,128
9613 DATA 141,141,136,141,141,13
6,133,133,128
9614 DATA 128,141,136,128,143,13
6,128,141,138
9615 DATA 133,138,136,128,137,12
8,129,133,136
9616 DATA 132,135,128,132,134,13
2,133,148,134
9617 DATA 128,138,128,128,128,12
8,128,128,128
9618 DATA 132,138,128,133,128,12
8,129,136,128
9619 DATA 128,129,136,128,128,13
8,128,132,138
9620 DATA 128,141,137,133,143,14
3,132,136,134
9621 DATA 128,136,128,143,143,13
8,128,136,128
9622 DATA 128,128,128,128,128,12
8,132,130,128
9623 DATA 128,128,128,133,143,13
8,128,128,128
9624 DATA 128,128,128,128,128,12
8,133,128,128
9625 DATA 128,128,137,128,137,12
8,137,128,128
9626 DATA 132,131,136,133,128,13
8,129,140,130
9627 DATA 128,141,128,128,135,12
8,128,141,136
9628 DATA 132,131,136,129,132,13
8,132,142,136
9629 DATA 132,131,136,128,133,12
8,129,140,138
9630 DATA 128,141,128,133,141,13
8,128,133,128
9631 DATA 133,131,128,129,134,12
8,132,137,128
9632 DATA 128,137,128,133,140,12
8,133,141,128
9633 DATA 129,131,138,128,137,12
8,128,138,128
9634 DATA 132,131,136,128,143,12
8,129,140,130
9635 DATA 132,131,136,129,140,13
8,128,128,136
9636 DATA 128,136,128,128,130,12
8,128,136,128
9637 DATA 128,136,128,128,130,12
8,132,130,128
9638 DATA 128,137,128,133,128,12
8,128,134,128
9639 DATA 128,128,128,129,131,13
8,129,131,130
9640 DATA 128,134,128,128,128,13
8,128,137,128
9641 DATA 132,131,136,128,137,12
8,128,136,128
9642 DATA 128,140,128,133,133,13
7,128,131,128
9643 DATA 133,131,138,133,140,13
8,133,128,138
9644 DATA 133,131,136,133,131,13
6,133,140,130
9645 DATA 132,131,136,133,128,12
8,129,140,138
9646 DATA 133,131,136,133,128,13
8,133,140,130
9647 DATA 133,131,130,133,131,13
0,133,140,138
9648 DATA 133,131,130,133,131,13
0,133,128,128
9649 DATA 132,131,136,133,132,13
8,129,140,130
9650 DATA 133,128,138,133,131,13
8,133,128,138
9651 DATA 129,139,128,128,138,12
8,132,142,128
9652 DATA 128,128,130,132,128,13
8,129,140,130
9653 DATA 133,132,130,133,136,12
8,133,129,136
9654 DATA 133,128,128,133,128,12
8,133,140,135
9655 DATA 142,132,138,136,130,13
8,138,128,138
9656 DATA 133,128,138,133,134,13
6,133,128,138
9657 DATA 132,131,136,133,128,13
8,129,140,128
9658 DATA 133,131,136,133,140,13
0,133,128,128
```

```
9859 DATA 132,131,136,133,132,13
8,129,140,134
9860 DATA 133,131,136,133,140,13
0,133,129,136
9861 DATA 132,131,136,126,134,12
8,129,140,130
9862 DATA 131,139,130,126,133,12
8,128,136,126
9863 DATA 133,128,138,133,128,13
8,129,140,130
9864 DATA 136,128,138,133,133,12
8,126,130,126
9865 DATA 136,136,138,136,136,13
?,139,129,136
9866 DATA 133,126,128,126,143,12
8,133,126,135
9867 DATA 133,126,136,129,140,13
0,126,143,126
9868 DATA 129,131,136,126,137,12
8,133,140,136
9869 DATA 132,130,126,133,128,12
8,129,136,128
9870 DATA 128,126,137,128,137,12
8,137,128,126
9871 DATA 126,129,136,126,126,13
8,128,132,130
9872 DATA 126,141,136,129,133 12
9,128,133,128
9873 DATA 126,128,128,126,128,12
8,132,140,136
9874 DATA 132,131,136,133,140,12
8,133,140,136
9875 DIM T(65,9). FOR W=1 TO 65.
 FOR U=1 TO 9. READ T(W,U)  NEXT
 U  NEXT W
9880 PRINT AT 10,6;"SAVE NUMERIC
 ARRAY"
9885 SAVE "LARGECHARS" DATA T()
9886 PRINT AT 10,6,"VERIFY NUMER
IC ARRAY"
9887 VERIFY "LARGECHARS" DATA T(
)

9000 REM ***********************
9001 REM * ROUTINE TO PRINT     *
9002 REM * LARGE CHARACTERS     *
9003 REM * FROM INPUT Z$        *
9004 REM ***********************
9005 REM
9010 IF LEN Z$>10 THEN RETURN
9015 DIM W$(3,30)
9020 FOR Y=1 TO LEN Z$
9025 IF CODE Z$(Y)>96 AND CODE Z
$(Y)<123 THEN LET Z$(Y)=CHR$ (CO
DE Z$(Y)-32)
9030 IF CODE Z$(Y)>96 OR CODE Z$
(Y)<32 THEN RETURN
9035 LET V=0
9040 FOR W=1 TO 3· FOR U=1 TO 3
9045 LET V=V+1
9050 LET W$(W)((Y-1)*3+U)=CHR$ T
(CODE Z$(Y)-31,V)
9055 NEXT U  NEXT W  NEXT Y
9060 PRINT W$(1)'W$(2) W$(3)   PA
INT
9068 RETURN
```

Large Characters
by Andrew Gregory

Multiply

on Dragon 32

This program is designed to teach long multiplication to children. Even though you might think that the program is long winded, you may find useful routines for positioning numbers on the screen in the right columns

Program notes

First it picks two random numbers, both between 10 and 99. It then displays the question as it would be set out on paper. It asks four multiplication sums as you would in a long multiplication problem, and fills in the answers in the display. Any figures to carry are added and super-scripted.

The computer then asks for the number displayed on the top row, followed by the number on the bottom row. These are added together, and the computer checks whether the answer is correct, and replies accordingly. You are then asked to press a key, and another sum is chosen and so on.

```
10 REM *******************
20 RE  *     MULTIPLY     *
30 REM * BY MARK HARRISON *
40 REM *******************
50 CLEAR 800
60 A=RND(90)+9:B=RND(90)+9
70 CLS
80 A$=STR$(A):B$=STR$(B)
90 LA=LEN(A$) LB=LEN(B$)
100 PRINT@16-LA,A
110 PRINT@48-LB,B,"X"
120 PRINT@75,"---------"
130 PRINT@139,"    0 +"
140 PRINT@171,'---------'
150 A1=VAL(LEFT$(A$,2))
160 A2=VAL(RIGHT$(A$,1))
170 B1=VAL(LEFT$(B$,2))
180 B2=VAL(RIGHT$(B$,1))
190 PRINT@320,'';
200 E2$='WHAT IS "+STR$(B2)+" X "+STR$(A
1)
210 E1$='WHAT IS "+STR$(B2)+' X '+STR$(A
2)
220 E3$="WHAT IS '+STR$(B1)+" X "+STR$(A
2)
230 E4$="WHAT IS '+STR$(B1)+' X '+STR$(A
1)
240 E1$=STRING$(32,32)+STRING$(32,8)+E1$
250 E2$=STRING$(32,32)+STRING$(32,8)+E2$
260 E4$=STRING$(32,32)+STRING$(32,8)+E4$
270 PRINT E1$, INPUT S$ S=LEN(S$):PRINT
@112-S,S$, PRINT@320,"', UL=VAL(S$) IF U
L>9 THEN CA=10*(INT (UL/10)):CA=CA/10
280 PRINT@320, E2$,.INPUT S$:UL=VAL(S$)'
UL=UL+CA S$=STR$(UL):S=LEN(S$).PRINT@111
-S,S$,'PRINT@320 UL=VAL(S$)
290 PRINT@320, E3$; INPUT S$.CA=0 UL=VAL
(S$) UL=UL+CA.S$=STR$(UL):S=LEN(S$) PRIN
T@143-S,S$,:PRINT@320.UL=VAL(S$) IF UL>9
 THEN CA=10*(INT(UL/10))
300 PRINT@320, E4$, INPUT S$:CA=CA/10:UL
=VAL(S$) UL=UL+CA S$=STR$(UL) S=LEN(S$):
PRINT@142-S,S$, PRINT @320
310 PRINT@320,"ENTER FIRST THE NUMBER ON
 THE   TOP ROW THEN THE NUMBER ON THE  B
OTTOM ROW
320 INPUT TR,BR
330 ST=TR+BR PRINT@479,STRING$(255,8);
340 PRINT@320,'YOUR ANSWER TO THE SUM IS
';ST
350 IF ST=A*B THEN PRINT@352, AND YOUR A
NSWER WAS CORRECT! ELSE PRINT@352, AND
YOU MADE A SLIGHT MISTAKE  PRINT THE ANS
WER SHOULD HAVE BEEN ,A*B
360 ST$=STR$(ST)
370 S=LEN(ST$)
380 PRINT@208-S,ST$,
390 PRINT@416, PRESS A KEY.
400 IF INKEY$=''  THEN 400 ELSE RUN
```

Multiply
by Mark Harrison

Christmas Carol

on Commodore 64

This program will play the Christmas carol O Little Town of Bethlehem in one, two or three voices. You have the option to hear the tune, descant or bass on their own or in any combination.

This allows you to hear a voice, for example, the bass, and enables you to play the tune on a musical instrument of your own. You can either do this or sit back and listen to your Commodore 64 play its music to you.

Program notes

20	Sets sustain/release for voice 1, 2 and 3
30	Sets type of sound for the voices
70	Pokes the notes into the SID chip
80	Time loop for each note played

The words printed in graphics in lines 520, 560 and 600 are *Tune*, *Descant* and *Bass* respectively.

```
10 FORL=54272TO54296 POKEL,0 NEXT POKE54296,15 GOSUB500 PRINTA$
20 POKE54278,240 POKE54285,128 POKE54292,240
30 POKE54275,9 POKE54274,10 POKE54282,11 POKE54281,10 POKE54289,3 POKE54288,10
40 READA,B,C,D,E,F,G
50 IFG=-1THEN640
60 POKE54276,V1 POKE54283,V2 POKE54290,V3
70 POKE54273,A POKE54272,B POKE54280,C POKE54279,D POKE54287,E POKE54286,F
80 FORL=0TOG NEXT GOTO20
90 DATA,,,,,,400
100 DATA17,37,4,73,8,147,180,,,,,,,22,227,17,37,5,185,180,,,,,,,
110 DATA22,227,19,63,6,108,180,,,,,,,22,227,17,37,7,53,180,,,,,,,
120 DATA25,177,17,37,5,103,180,,,,,,,28,214,14,107,5,185,70
130 DATA25,177,12,216,,,70,28,214,14,107,4,208,70,30,141,15,70,,,70
140 DATA34,75,17,37,4,73,170,,,,,,,28,214,17,37,5,185,170,,,,,,,
150 DATA30,141,19,63,7,163,170,,,,,,,28,214,14,107,7,163,70
160 DATA22,227,11,114,7,163,70,25,177,21,154,8,147,170,,,,,,
170 DATA25,177,15,70,8,147,170,,,,,,,22,227,17,37,5,185,320
180 DATA22,227,17,37,4,208,320,22,227,17,37,4,73,230,,,,,,
190 DATA17,37,15,70,5,103,170,,,,,,,22,227,17,37,5,185,170,,,,,,,
200 DATA22,227,17,37,5,103,170,,,,,,,22,227,17,37,4,208,170,,,,,,,
210 DATA25,177,17,37,5,103,170,,,,,,,28,214,17,37,5,185,70
220 DATA25,177,12,216,,,70,28,214,14,107,4,208,70,30,141,15,70,,,70
230 DATA34,75,24,63,4,208,170,,,,,,,28,214,17,37,4,208,170,,,,,,,
240 DATA30,141,22,227,6,108,170,,,,,,,28,214,14,107,7,53,70
250 DATA22,227,11,114,7,163,70,25,177,21,154,8,147,170,,,,,,
260 DATA25,177,15,70,8,147,170,,,,,,,22,227,17,37,5,185,280
265 DATA22,227,17,37,4,73,280,22,227,17,37,5,185,280,,,,,,
270 DATA22,227,,,,,70,28,214,,,,,70,34,75,21,154,7,53,400,,,,,,
280 DATA30,126,19,63,7,53,70,34,75,17,37,8,147,70,30,141,15,70,8,147,70
290 DATA28,214,14,107,8,147,70,25,177,12,216,8,147,70,22,227,11,114,5,185,70
300 DATA25,177,12,216,5,185,70,28,214,14,107,5,185,70,30,141,15,70,8,147,70
310 DATA34,75,17,37,8,147,170,,,,,,,17,37,,,8,147,170,,,,,,,
320 DATA22,227,11,114,5,185,170,,,,,,,28,214,14,107,5,185,170,,,,,,,
330 DATA25,177,15,70,7,163,170,,,,,,,22,227,11,114,7,163,170,,,,,,,
340 DATA17,37,8,147,4,73,300,17,37,8,147,7,163,270,,,,,,,17,37,8,147,4,73,300
350 DATA17,37,8,147,10,205,270,,,,,,,22,227,11,114,5,185,170,,,,,,,
360 DATA22,227,11,114,5,103,170,,,,,,,22,227,11,114,4,208,170,,,,,,,
370 DATA25,177,12,216,4,73,170,,,,,,,28,214,14,107,3,210,70
380 DATA25,177,12,216,3,155,70,28,214,14,107,3,210,70,30,141,15,70,4,73,70
390 DATA34,75,17,37,4,208,170,,,,,,,28,214,14,107,4,208,170,,,,,,,
400 DATA30,141,22,227,6,108,170,,,,,,,28,214,22,227,5,185,70
410 DATA22,227,19,63,4,208,70,25,177,21,154,5,103,70,25,177,21,154,5,185,0
420 DATA,,,,,,25,177,21,154,6,108,70,25,177,21,154,4,73,70
430 DATA22,227,11,114,5,185,70,22,227,11,114,8,147,70,22,227,11,114,7,53,70
440 DATA22,227,11,114,8,147,70,22,227,11,114,5,185,1200
450 DATA-1,-1,-1,-1,-1,-1,-1,-1
500 POKE53280,4 POKE53281,2
510 PRINTCHR$(14)"          LITTLE TOWN OF BETHLEHEM"
515 PRINT"        
516 PRINT"            Y PHILIP FRY (C)                   
517 PRINT"              ECEMBER 1983"
520 PRINT"      OULD YOU LIKE THE     (Y/N)?...."
530 GETA$ IFA$="Y"THENV1=65 GOTO560
540 IFA$="N"THENV1=0 GOTO560
550 GOTO530
560 PRINTA$ PRINT"    OULD YOU LIKE THE         (Y/N)?...."
570 GETA$ IFA$="Y"THENV2=65 GOTO600
580 IFA$="N"THENV2=0 GOTO600
590 GOTO570
600 PRINTA$ PRINT"    OULD YOU LIKE THE      (Y/N)?...."
610 GETA$ IFA$="Y"THENV3=65 RETURN
620 IFA$="N"THENV3=0 RETURN
630 GOTO610
640 POKE54277,12 POKE54278,0 POKE54284,12 POKE54285,0 POKE54291,12 POKE54292,0
650 FORL=0TO3000 NEXT POKE54296,0
```

Christmas Carol
by P Fry

SUNSHINE

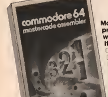


Mastercode Assembler

for the Commodore 64

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Mastercode is a substantial and complex program of use to anyone interested in writing machine code on the Commodore 64. Its features include:

- ☐ Machinecode monitor
- ☐ File Editor
- ☐ Disassembler
- ☐ Assembler

Mastercode is a full two pass assembler It accepts labels, variables and equations within assembly language programs It is possible to store programs anywhere in memory, even in parts occupied by the Assembler Programs can be saved to either tape or disc

The Machine Code Monitor includes:

■ OUTPUT OF MEMORY TO SCREEN OR PRINTER ■ MODIFICATION OF MEMORY ■ EXECUTION OF MACHINE CODE PROGRAMS ■ SAVING OF MACHINE CODE FILES ON TO TAPE OR DISC ■ LOADING OF MACHINE CODE FILES FROM TAPE OR DISC ■ STEP BY STEP TRACING OF THE EXECUTION OF A MACHINE CODE PROGRAM INCLUDING DISPLAY OF REGISTER CONTENTS

The Disassembler will translate into assembly language the contents of any area of memory, whether the 64's ROM or a user program Output may be sent either to the screen or a printer

The File Editor includes:

■ ENTRY OF NUMBERED LINES OF ASSEMBLY LANGUAGE INSTRUCTIONS ■ LISTING INDIVIDUALLY OR IN BLOCKS OF PREVIOUSLY ENTERED LINES ■ DELETION INDIVIDUALLY OR IN BLOCKS OF EXISTING LINES ■ RENUMBERING OF EXISTING LINES ■ SAVING OF ASSEMBLY LANGUAGE FILES TO TAPE OR DISC ■ LOADING OF ASSEMBLY LANGUAGE FILES FROM TAPE OR DISC ■ ADDITION OF A BLOCK OF MEMORY SPECIFIED BY THE USER TO THE USER'S ASSEMBLY PROGRAM

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Ladders Run

on Vic20

This is a program for the unexpanded Vic20. The program starts by drawing ladders and ledges. The object of the game is to reach the top exit before one of the falling bricks hits you. After reaching the top exit you are rewarded with 500 points and a new and harder screen of ladders and ledges.

Program notes

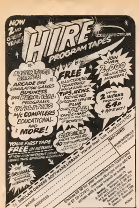
6	Screen set up
45-60	Key press
78-81	Pokes blocks on to screen
510-630	Data for screen

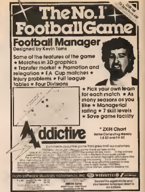
Controls T = UP V = Down F = Left G = Right

PROGRAM OF THE WEEK

```
5 PRINT"■" POKE36879,10 M=8146 P1=96 P2=
96 POKE650,128 L1=115 L2=107 O=1 POKE3687
8,15
6 READA$ IFA$="END"THEN40
7 PRINTA$  GOTO6
39 POKE36877,0 POKE37879,50
40 GETA$ POKE36874,0
41 IFO=1ANDM<7660THENM=8166 P1=64 P2=64 O
=2 PRINT"■" Q=Q+500 F=0 L=0 GOTO6
42 POKEM,P2 POKEM-22 P1
43 IFO=2ANDM<7680THENRESTORE M=8166 P1=96
 P2=64 P=0 L=0 PRINT"■" O=1 Q=Q+1000 GOTO
6
44 PRINT"■■■■■■■■■■SCORE"Q
45 IFA$="T"ANDP2=64THENP2=P1 M=M-22 P1=PE
EK(M-22) POKE36874,245 GOTO70
50 IFA$="V"ANDPEEK(M+22)=64THENP1=P2 M=M+
22 P2=PEEK(M) POKE36874,245 GOTO70
55 IFA$="F"ANDPEEK(M-1)<>160THENPOKE36874
,245 GOTO100
60 IFA$="G"ANDPEEK(M+1)<>160THENPOKE36874
,245 GOTO110
65 P1=PEEK(M-22) P2=PEEK(M)
70 POKEM,88 POKEM-22,81
78 IFP=0THENP=1 B=INT(RND(1)*22)+7658 S=2
50
79 IFP=1THENGOSUB200
80 IFL=0THENL=1 A=INT(RND(1)*22)+7658 S2=
250
81 IFL=1THENGOSUB300
90 GOTO40
100 IFPEEK(M+22)=160ORPEEK(M-45)=160ORPEE
K(M+22)=115ORPEEK(M+22)=107THENM=M-1
105 GOTO65
110 IFPEEK(M+22)=160ORPEEK(M-45)=160ORPEE
K(M+22)=115ORPEEK(M+22)=107THENM=M+1
115 GOTO65
200 POKEB,B2 B=B+42 IFA=BTHENB=B-1
205 B2=PEEK(B) POKEB,102 S=S-1 POKE36876,S
210 IFB=MORB=M-22THEN400
220 IFB>8185THENP=0 Q=Q+10
230 RETURN
300 POKEA,A2 A=A+45 IFA=BTHENA=A-1
305 A2=PEEK(A)  POKEA,102 S2=S2-1 POKE368
75,S2
310 IFA=MORA=M-22THEN400
320 IFA>8185THENL=0 Q=Q+5
330 RETURN
400 POKE36875,0 POKE36876,0 POKE36877,200
405 FORT=10TO0STEP-1 FORR=0TO20 POKE36878
,T POKE36879,T NEXTR NEXTT
410 PRINT"■■■■■■■■■■GAME OVER"
415 POKE36879,10
420 PRINT"■■PRESS ■ S P A C E "
430 GETA$ IFA$<>" "THEN430
440 POKE36877,0 RUN
510 DATA"■■ ■■├─┤■■                      ■'
511 DATA"■■■├─┤■■                       ■'
512 DATA"■ ■■├─┤■                    ■ ■"
514 DATA"■ ■■├─┤■                    ■ ■'
515 DATA"■              ■■├─┤■■       ■'
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531 DATA"■              ■■├─┤■■       ■'
532 DATA"■ ■             ■├─┤■        ■ ■'
533 DATA"■ ■             ■├─┤■        ■ ■"
534 DATA"■ ■■├─┤■■                    ■'
540 DATA"END"
600 DATA"■■ ■■├─┤■■                   ■'
601 DATA"■■■├─┤■■                     ■'
602 DATA"■ ■■├─┤■     ■ ■             ■ ■
603 DATA"■ ■■├─┤■     ■ ■             ■ ■'
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615 DATA"■ ■■├─┤■      ■ ■■├─┤■■ ■      ■├─┤■
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617 DATA"■ ■      ■├─┤■■ ■■├─┤■■ ■■├─┤
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618 DATA"■ ■      ■├─┤■■ ■■├─┤■■ ■■├─┤
■■ ■"
619 DATA"■ ■■├─┤■■        ■■├─┤■■      ■■├─┤
■■ ■"
620 DATA"■ ■■├─┤      ■■ ■■├─┤      ├─┤ ■■ ■'
621 DATA"■ ■■├─┤      ■■ ■■├─┤      ├─┤ ■■ ■'
622 DATA"■ ■■├─┤■■                    ■'
630 DATA"END"
```

Ladders Run
by Steven Fletcher


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Santa's Grotto

on Spectrum

The object of this game is for you (the sledge) to pinch all of Santa's presents before your time runs out.

You die if you run into the flashing boxes at the bottom of the screen or your time runs out. You lose a life if you run into a wall or Santa.

```
[illegible]
```

Santa's Grotto
by I Grainger

Microradio

GW6JJN

Radio Teletype

This week finds me still trying to answer your letters. I am always pleased to receive enquiries from people who want to know more about how to become a radio amateur. Books and leaflets are available from the Radio Society of Great Britain, Alma House, Cranbourne Road, Potters Bar, Herts EN6 3JW.

As I mentioned last week, many of you write to me asking how and where to find the software and/or hardware to transmit and receive Radio Teletype (RTTY) on your micro. This week I will give you the addresses to write to for your particular machine.

Commodore 64. A unit is available which will handle RTTY, ASCII, Morse and other modes from ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN8 0NX.

Dragon. A machine code program is available from M Kerry, 22 Grosvenor Road, Seaford, Sussex.

ZX81 and Spectrum. An RTTY system is available from Sinclair Amateur Radio Users Group, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.

BBC Computer. There are a few sources: SP Electronics, 48 Linby Road, Hucknall, Notts. Also Ramtop, The School, Wellingborough, Northants NN8 2BX. More BBC software is available from GOC Software, 47 Cranberry Lane, Alsager, Stoke-on-Trent. GOC produce RTTY systems and various morse programs.

I have had a letter or two from people with Atari micros and I must admit that I do not know of a single source for an Atari RTTY system in the UK. I can only suggest that you write to Atari in the United States in order to get their advice. If anyone has RTTY on an Atari up and running please let me know.

It seems to me that there are an awful lot of you out there looking for radio related software for your micro. There is not very much software about and since more and more radio enthusiasts are becoming micro-owners, a market is opening up in this area.

Ray Berry GW6JJN

This series of articles is designed for radio and microcomputer enthusiasts alike. If you have any queries that you want answered, hints and tips to share or topics that you would like to see covered, write to Ray Berry, Microradio, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2H 3LD.



Christmas quiz

The last week of 1983 — and what a busy year it's been for everybody interested in home — sorry, popular computing. The Spectrum, Commodore 64 and Atari machines have between them dragged computer games off the block graphics *Space Invaders* shelf and into high resolution arcade quality. In the same way these machines and others have done a similar job with adventure programs, forcing the software houses into ever better products.

And what products we've been treated to in the last year! 1983 will go down in microadventure history as *The Year of The Hobbit* — and its chronicle, The Hobbit Hall of Fame! Now that versions have been released for computers other than the Spectrum, I imagine many of you will have a nice little package in your Christmas stocking and, although it'll keep you busy for some while, I expect to see some non-Spectrum names appearing in the HHOF.

Other 1983 programs I personally enjoyed were *Valhalla* and Level 9's adventures. I'm glad to be able to report that Level 9, whose programs are in the classic style, have some new adventures out soon.

Speaking of little packages, the last review of 83 is of some book/tape packages from Puffin/Penguin Books. The big book publishers have seen the light and decided that software can be sold just like books. They have taken one of their best selling titles — "The *Warlock* of Firetop Mountain" — and combined it with a tape.

This book, by Steve Jackson and Ian Livingstone, in case you haven't seen it or any of the several follow-ups, takes the form of a multiple-choice solo fantasy/adventure. Borrowing heavily from *Tunnels and Trolls* fantasy role playing rules, the book takes the reader through a complex adventure. Starting from a dark cave entrance and an east west junction, the player/reader chooses which way to go and then turns to the relevant page to find what his fate is. Coming upon a monster, the player may sometimes choose to run, or engage in combat or take some other action.

The tape accompanying the book is of a Spectrum program written by Crystal Computing. Regular readers of Adventure Corner will remember their program *Halls of the Things* which I enthused over a few weeks ago. Not really adventure, I know, but a very stylish Arcventure, with more than touch of the magicals about it!

Warlock is essentially a remake of Hott and it has lost quite a bit in the process, I'm afraid. The differences are too numerous to go into here — suffice to say that *Hott* will remain my favourite. *Twolm*, however, retains Crystal Computing's customary panache and only suffers in comparison with the earlier program — in its own right, it is a fast-moving, finger-numbing Arcventure. It's not much to do with the book although some of the creatures from the book make an appearance, as does the basic idea, that of collecting a number of keys in order to open the chest which contains the Warlock's treasure. As a package, *The Warlock of Firetop Mountain* is great value, and worth sticking in anybody's stocking.

Now, if the family have started to complain about you playing *The Hobbit* over your Christmas lunch, and the jokes in the crackers have got too boring, why not have a go at the Adventure Corner Christmas 83 Quiz? Just pick up a pencil, and put your answers on the back of a blank cheque.

1. You find an open can of baked beans. Do you:

a) Eat them cold
b) Draw your sword and run it through
c) Look around for a gold sculpture

2. You hear a rustling behind the door. Do you:

a) Bung up the keyhole with Blu Tack
b) Draw your sword and charge
c) Put the Golden Key in the lock

3. A giant dog with brandy round his neck blocks your path. Do you:

a) Lie down and pretend to have frostbite
b) Draw your sword and run him through
c) Get out your club

4. The butler offers you a drink. Do you:

a) Say "Thanksh"
b) Draw your sword etc
c) Jump in the Barrel

5. A little green man is sitting on a mirror. Do you:

a) Give him a tip for the 2.30 at Aintree
b) Draw
c) Put on your gloves

6. You see a pair of Safety Sneakers. Do you:

a) Turn up your nose
b) Tear them to shreds
c) Wear them

7. A little plant whimpers "Water ... water ...". Do you:

a) Pick the flower and put it in your buttonhole
b) Stomp on it merrily
c) Water it and stand well back

Have a look at your answers — if you got mostly a's, then you should probably be out night-clubbing instead of playing with computers. If you got mostly b's, then you are probably an older D&Der in search of a new home — keep trying! If you got mostly c's, then you are a clever clogs!

Have a Happy (Adventuring) Christmas, and I hope your New Year will find you completing many more Adventures! ■

Are you stuck in an adventure? Are you faced by a problem that seems insurmountable? *Adventure Helpline* may be the answer.

Adventure Helpline is quite simply designed to put adventurers in touch with one another. Where you may be stumped by a baffling puzzle, a fellow adventurer may be able to help. By the same token, you may be able to help other people with their problems.

If you are having difficulties with an adventure, fill in the accompanying coupon and send it to:
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We shall publish *Adventure Helpline* entries each week in their own special column.

Adventure Helpline

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Adventure ______

Problem ______

______

______

Name ______

Address ______

______

______

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge, Adventure Corner, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD.

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ALL GREEK

Mr A Wallis of Haweswater Place, Morecambe, Lancashire, writes

Q **My son has a Vic20 computer, and though it all seems to be Greek to me, he obviously understands it. A friend whose son is selling an Atari television computer, also has a joystick for sale. I have been told by my son that it is possible to use Atari joysticks on the Vic. Is this true and is it safe, will it damage the computer?**

A No your son is quite right The Atari and Vic joysticks are in fact the same, apart from minor differences in styling So it is quite possible to use one type of joystick on the other type of computer

VIDEO SIGNAL

G Butterworth of Belveres Avenue, Blackpool Lancashire, writes

Q **With reference to your article in *PCW*, 17-23 November, about connecting a Spectrum 2/3 issue up to a monitor. After reading this I wrote to Sinclair and they informed me that "they were unable to comment or advise on modifications" and "to open the case automatically invalidates the guarantee". I then managed to exchange my issue 2 Spectrum for an issue 3. On arriving home, to my disappointment, I found that issue 3s do not give a video signal. Perhaps I have read your article wrongly?**

Please could you answer a couple of questions What do you mean by a video signal and can you tell me how I can hook up my Sharp DV 1600 colour tv/monitor to my Spectrum? My monitor has the usual type of phono sockets, like my video recorder If you can help me, and possibly other readers as well, I would be very grateful.

A The Spectrum issue 3 does give a composite video output from the expansion port at the back If you look at the chapter in the handbook on the port you will see the lines 0 volts and Vid on the underside of the port in the middle This is where you take the composite video signal from, so all you need is an edge connector, and you should be able to use it on your 1600 tv/monitor

Perhaps I did not make myself clear, but in all fairness to Sinclair, they cannot be expected to extend the guarantee, or offer advice on any computer that has been 'tinkered' with The reason I included that question was that I have been asked it several times I can tell people what to do, but going ahead must be at their own discretion

TOKEN INPUT

Simon Dale of Swaleside Richmond North Yorkshire, writes

Q **I have a Vic20 with 16K expansion. Though I will probably be getting a Commodore 64 sometime, I am pleased with my Vic**

A friend has shown me how to use token Input, to allow me to use longer lines However, he did not really seem to know how they worked Can you explain?

A It is due to the operating system, which employs 'text compression' All the key words used by the Vic are stored as a number from 0 to 255 If you write a keyword such as *Input* it will be stored as five bytes of screen memory Nevertheless, it will leave the *Input* buffer as a single byte with a specific value (132 in this case)

However many bytes of screen memory are taken up, it will always be stored as just a single byte When, in the case of *Input* you use *I shift N*, all you are doing is tricking the computer into thinking that you have entered the full command Indeed, you have but it has only taken two bytes

When you *List* the program the process is reversed

MINI COMPUTER

John Masterman of Dalcross Middlesbrough, Cleveland, writes

Q **I have been given a pair of mini-computer systems, made by Nixdorf. Each system comprises one console, including a dedicated tape deck. One hard disc drive (twin pack with five megabyte capacity), one fast printer and a CPU unit card I also have another hard disc drive and about 40 packs.**

I fully appreciate that the system is long out of date, as has been demonstrated by the manufacturer who has recently withdrawn user support My experience with computers hitherto has been limited to micros I have been advised by one person to scrap the lot, by another to 'play' with it, or to take the gold from the edge connectors.

I use a fully expanded Vic20. I have interfaced a printer to it, which was previously used on the system (a twin head dot matrix). I am now working on an interface for the two fast printers.

Can you advise me if the above system is going to be of use for anything other than just scrap? Can you tell me how to write to the system? The discs contained software, but no method for producing or writing one's own. I am loath to dispose of the equipment to the scrap man The components alone might be very useful Are there any museums for computers yet?

A I wish someone would give me a couple of 5 megabyte hard discs Do they work? It is important to remember that just because the computer is out-of-date, it does not mean that the peripherals are out-of-date

There are several questions to ask yourself Does the system run CP/M? If it does then it could still be very useful to a small business Do the peripherals all work? How much would replacement hard discs cost? This will probably give you an insight into the possible value of the hardware you are considering scrapping From your letter I am assuming that you do not have the original instruction manuals This is a major drawback as such things are not easy to replace

All in all, if the system basically works and you feel it offers capacity beyond your needs, then I would suggest that you offer it for sale On the other hand, if you are handy with a soldering iron then a Vic20 running with a 5mb hard disc would give your computer system a certain individuality that would be difficult to match Before you ask, no I do not know of any driver cards to interface a Vic with a hard disc

ARRAY MEMORY

Lance Walton of Seafield Road Southbourne Bournemouth writes

Q **Please could you tell me how to find out how much memory an array takes up? Also, my father has a Silver Read EX 44 Electric typewriter which I think has an RS232B interface. Can I use this as a printer for my Beeb computer? Also could you advise me on a book to buy about BBC machine code, as I am an absolute beginner and would like to learn.**

A I can see no reason why the Silver Reed should not be used with a BBC — I have heard of it being used with a Spectrum

However it does not have an RS232 interface I telephoned them and they told me that the RS232 was in fact an additional module that you would have to get through your dealer The port on the typewriter is unique, and I have no details about it

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2R 3LD.

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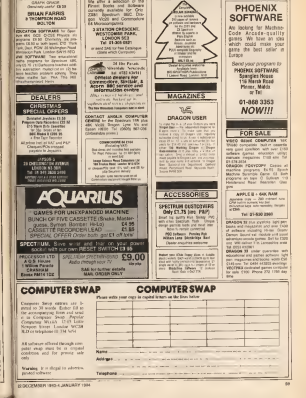
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WANTED Vic20 cassette software (second hand) Mr Allan Low Apt Blk 19 Marine Terrace 09-44 Singapore 1544 Singapore

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SWAP Scalextric track Scalextric Stock Car set bought for £63 sell £35 or swap for my Spectrum hardware But who am I? And where do I live?

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WANTED Casio SX702P also swap software for ZX Spectrum Tel 7695726

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SPECTRUM SOFTWARE to swap good selection of all types available would like mainly adventures Write for list to Alan Turnbull 23 Glebelands Exminster Exeter

DRAGON SOFTWARE to swap lots of titles or sell £4 each Tel 0272-663572 (Bristol) ring after 7 30 pm

SWAP my Vic20 Pirate's Cove adventure for your Adventureland cartridge (private sale) Tel Leigh S nton 32884

EXCHANGE Binatone Longranger 40 channel 4w hand new CB for RD digital tracer/fuller FDS keyboard or good custom case for Spectrum or sell £30 Chris 01 979 5047 (9-5 only) Teddington

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LOW COST SOFTWARE

DRAGON 32

Program Name	Supplier	Price inc VAT
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Backgammon	Microdeal	6.90
Cosmic Zap	Microdeal	8.00
Cuthbert Goes Walkabout	Microdeal	8.90
Defence	Microdeal	8.00
Dragon Invaders	Microdeal	8.00
Flipper	Microdeal	8.00
Frogger	Microdeal	8.00
Golf	Microdeal	8.00
Invaders Revenge	Microdeal	8.00
Jerusalem Adventure 2	Microdeal	8.90
Katerpillar Attack	Microdeal	8.00
Mansion Adventure 1	Microdeal	8.00
Monaco Grand Prix	Microdeal	8.00
Planet Invaders	Microdeal	8.00
Scarfman	Microdeal	8.00
Shuttle	Microdeal	8.00
Syzygy War	Microdeal	8.00
Talking Android Attack	Microdeal	8.90
The King	Microdeal	8.00
Williamsburg Adventure	Microdeal	8.00
Ultimate Adventure 4	Microdeal	8.90

COMMODORE 64

Program Name	Supplier	Price inc VAT
Sprite Graphics	Rabbit	5.99
Escape MCP	Rabbit	5.99
Paratroopers	Rabbit	5.99
Centropods	Rabbit	5.99
Cyclons	Rabbit	5.99
Monopoles	Rabbit	5.99
Annihilator	Rabbit	5.99
Paratroopers	Rabbit	5.99
Potty Painter	Rabbit	5.99
Lancer Lords	Rabbit	6.99

VIC20

Programme Rabbit	Supplier	Model	Price inc VAT
Arcadia	Imagine	Unex	5.50
Wacky Waiters	Imagine	Unex	5.50
Catcha Snatcha	Imagine	Unex	5.50
Frantic	Imagine	Unex	5.50
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Tornado	Quicksilva	Unex	5.95
Harvester + Brainstorm	Quicksilva	Unex	7.95
Pixel Power	Quicksilva	16K	7.95
Trader	Quicksilva	16K	14.95
Subspace Striker + Zor	Quicksilva	16K	7.95
Stampede + Encounter	Quicksilva	16K	7.95
Paratrooper	Rabbit	Unex	5.99
Annihilator Spinner	Rabbit	Unex	5.99
The Catch	Rabbit	Unex	6.99
English Invaders	Rabbit	Unex	5.99
Paratrooper	Rabbit	Unex	6.99
Escape MCP	Rabbit	Unex	5.99
Critters	Rabbit	8K	5.99
Cyclons	Rabbit	8K	5.99
Potty Fun	Rabbit	Unex	5.99
Scramble	Rabbit	Unex	5.99
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Quackers	Rabbit	Unex	5.99
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Martian Raider	Rabbit	Unex	5.99
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Rabbit Rabbit	Rabbit	Unex	5.99
Rabbit Blaster	Rabbit	Unex	6.99
Time Destroyers	Rabbit	8K	5.99

SPECTRUM

Program Rabbit	Supplier	Rabbit	Price inc VAT
Arcadia	Imagine	16K	5.50
Schizoids	Imagine	16K	5.50
Ah Diddums	Imagine	16K	5.50
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Trader	Quicksilva	48K	9.95
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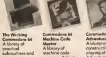
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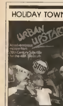
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NEW RELEASES

HOLIDAY TOWN



Scarthorpe wouldn t be any one s idea of a holiday town — even the dogs carry knives. Unfortunately, you find your self trapped in Scarthorpe and your attempts to find the exit from the town form the basis of the latest Richard Shepherd game, *Urban Upstart*

It s an adventure in which every location is illustrated with graphics The screen is split in two, with the graphics displayed in the top section

The game understands quite a large vocabulary of words so that phrases can be connected to form a single sentence as in "Kill Fan and Take Trap"

I didn t have time to venture very far into the adventure, but it certainly seems to contain all the enigmatic clues you could want I'm afraid there is not much I can offer by way of helpful advice, except to point out that lager can be very bad for you

Program *Urban Upstart*
Price *£6 50*
Micro *Spectrum 48K*
Supplier *Richard Shepherd Software, Elm House, 23-25 Elmshott Lane, Cippenham, Slough, Berks*

A FORTUNE

If you have a Dragon 32 and are really committed to the idea of using it for education, then a new series of programs could be just what you need

Maths O level Revision part one uses four programs on two cassettes to teach things like area and volume aspects of calculus different sorts of interest, acceleration and how to construct various geometrical figures

By getting the complete maths series the entire O level syllabus will be covered — you will also have spent an absolute fortune each part costs £19 95 Not, perhaps, that it's unreasonable for four programs but a whacking price for software nevertheless

Program *Maths O level revision part one*
Price *£19 95*
Micro *Dragon 32*
Supplier *Ampalsoft, PO Box 19, Knutsford, Cheshire WA16 0HE*

SPEECH UNIT

A program to teach your children how to recognise letters and how to match upper and lower case Although hardly the first educational program of this type it is the first I've seen to make use of the BBC's famed speech unit

This involves the computer actually speaking the letter the child is required to recognise Correct entries are rewarded by the letter being eaten by a fish and a happy face appearing on screen Mistakes result in the fish being eaten by crocodiles.

There are various variations on the basic theme, as well as an "identification of skills achieved", which to you and I means a score

Program *Happy Letters*
Price *£6 97*
Micro *BBC*
Supplier *Bourne Educational Software, Bedfield Lane, Headbourne Worthy, Winchester, Hants SO23 7SQ*

GRAPHIC HAND

I've always thought it a bit silly using a computer to play board games on — unless the computer can be one of the players Nevertheless programs that do no more than replace board banker, dice and counters often do quite well

This time it's *Ludo* that gets the microchip treatment in a new program for the Vic20 and Commodore 64 This one does have some nice touches like a graphic hand that shakes the dice in their tumbler but it does not take the part of one of the players So it's simply a matter of throwing dice and moving counters with other people — *Ludo* is not a complex game

The Commodore 64 version also has an option to display the rules of the game at any time — well it might stop a few arguments anyway

Program *Ludo*
Price *£5*
Micro *Vic20/CBM 64*
Supplier *C P White Services, 52 Northfield Avenue, West Ealing, London W13 9SY*

GIANT MAZE

Since *Android 1* very little has been heard of Vortex Software Perhaps they have been saving themselves for *Android Two* which is definitely on my list of 10 best games for 1983

For those who did not see the original you control an android — a killing machine which you must guide through a maze to thwart the nasty millitoids

The game is beautifully depicted in 3D your vantage point being above and to the right to the giant maze Apart from finding the millitoids your android must also avoid various mines and other hazards in the form of bouncing alien minions

There are three zones of action each extending over several screens Like all the best games at first your task seems completely impossible but after a few plays you start to have some success — just enough to keep you playing until the wee hours Superb

Program *Android Two*
Price *£5 95*
Micro *Spectrum 48K*
Supplier *Vortex Software, 280 Brooklands Road, Manchester M23 9HD*

SUPERSONIC

Scram 20 is an arcade game for the Vic20 It is basically a version of *Defender* and has, amazingly enough, been fitted into the unexpanded machine

The game involves piloting a supersonic ship past various hazards and through narrowing tunnels to destroy an enemy base This version has six screens of hazards, the last of which contains the enemy base which you are attempting to destroy

Program *Scram 20*
Price *£5 95*
Micro *Vic20*
Supplier *Artic Computing, Main St, Brandesburton, Driffield, Yorks YO25 8RL*

MARAUDERS

Two Gun Turtle is another in Lothlorien s Actionmaster series which represents the company s move into arcade style games

Your role is that of a turtle defending his prize strawberrys from attack by marauding bugs

As you might expect, you blast away at the bugs to score points. However, it isn't quite as primitive as that — some of the bugs are quite harmless and will do neither you nor your strawberrys any harm, unless you fire at them first. This touch forces you to be responsible with your trigger finger.

The game is set in winter so from time to time snow can be expected to fall — this will mean increased danger and the chance for bonus points.

Program *Two Gun Turtle*
Price *£6.95*
Micro *Oric 1*
Supplier *M C Lothlorien, 56A Park Lane, Poynton, Stockport, Cheshire SK12 1AE*

KILLER ROBOTS

Floyd's Bank is a multi screen maze game for the Lynx computer. Each screen consists of part of the defences protecting gold and valuables stored in a bank vault.

The first section is a floor of plasma mines where the slightest vibration will set them off. Other sections involve constantly changing mazes and caverns patrolled by killer robots.

On each screen there is a time limit for completion of that section — take too long and deadly nerve gas will be released into the atmosphere.

Program *Floyd's Bank*
Price *£9.99*
Micro *Lynx*
Supplier *Romik Software, 272 Argyll Avenue, Slough, Berks*

TABLE GAME

Kick Off is a football simulation for the Commodore 64 — quite a brave release this since it's up against Commodore's mighty *International Soccer* cartridge.

This one is a bit different though, being based not on the rugged game for 11 players but on its humble counterpart — table football — the version where you spin bars of little men to try and get the ball in the back of the net.

The game features specially composed music and is graphically interesting. Although you can play against the computer, the two player version is particularly recommended. There is some specially composed, jaunty, football music to go with it and it's great fun.

Program *Kick Off*
Price *£6.99*
Micro *Commodore 64*
Supplier *Bubble Bus, The Computer Room, 87 High Street, Tonbridge, Kent TN1 1LS*

SNOWY WASTES

Bengo is an arcade/strategy game for the unexpanded Vic set in the wintry wastes of, well, somewhere very cold anyway.

Bengo, an innocent eskimo, is being chased around some blocks of ice by a yeti. *Bengo* naturally enough, wants to avoid being on the yeti's menu.

Bengo's only defences are to hide behind the blocks of ice and, at the right moment hurl them across the snowy wastes squashing, the snow yeti. If you defeat one snow yeti, you can rest assured that his friends will come to find him and so multiply your problems.

Program *Bengo*
Price *£6.00*
Micro *Vic20*
Supplier *Mr Micro, PO Box 24, Swinton, Manchester M27 3AI*

3 SECTIONS

Beyond Basic is what looks like a useful utility from Incognito Software marketed by Sinclair.

It is aimed at those people who are just beginning to investigate the subject of machine code and is a kind of mini-assembler, where all the commands are illustrated on screen in terms of what is happening in the registers.

The program is divided into three sections: the registers, assembler commands, and your own programs. The first of these explains the general workings of a computer and the simple ideas behind Z80 codes. The second section goes on to explain the main commands in the Z80 assembler instruction set. Finally, using these concepts, you can run your own program watching the changing display of storage and register values.

Program *Beyond Basic*
Price *£9.95*
Micro *Spectrum 48K*
Supplier *Sinclair Research, 23 Motcomb Street, London SW1X 8LB*

TARMAC TIM

Double Trouble is a version of *Amidar* with some nice touches, for the Spectrum 48K.

Tarmac Tim (that's you) has to paint the yellow lines of Sinclair Road (he's employed by Spectrumville District Council). The problem is that Tarmac has to deal with drivers who are positively Italian in their driving style and who are out to get him.

Tarmac also has to protect various pedestrians who are wandering in the middle of the road.

If a car gets through your hero will spill his paint. If he survives his shift, he will be awarded a bonus according to the number of pedestrians he has managed to save.

Program *Double Trouble*
Price *£5.90*
Micro *Spectrum 48K*
Supplier *Starlite Software, 1 Mercury Close, Lordshill, Southampton SO1 8BH*

FAST FOOD

Mr Wimpy is a computer game featuring jingles and characters from the series of advertisements by the well known burger company.

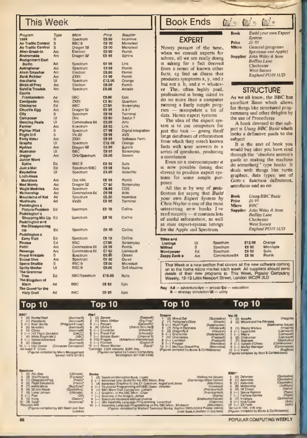
The game proves to be a version of the arcade winner *Burger Time* which is possibly my favourite game ever.

The game involves steering *Mr Wimpy* across a screen of bouncing manholes collecting ingredients for the burgers. If you manage this, then *Mr Wimpy* has to actually make the burgers by running across them and dropping them onto the plates below. Some of the other ingredients resent this and chase him around the screen — the egg is particularly nasty.

The game is excellently done with graphics more or less as good as those from Ultimate and includes a demo mode and options to use nearly every kind of joystick.

Program *Mr Wimpy*
Price *£5.90*
Micro *Spectrum 48K*
Supplier *Ocean Software, Ralli Building, Stanley Street, Manchester M3 5FD*

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD



This Week

Program	Type	Micro	Price	Supplier
1984	S	Spectrum	£5.50	Incentive
Air Traffic Control	S	BBC B	£9.95	Microdeal
Air Traffic Control	S	Dragon 32	£8.00	Microdeal
Alien Break-in	Arc	Electron	£6.99	Romik
Andromeda	Arc	Dragon 32	£6.95	Sphinx
Assignment East Berlin	Ad	Spectrum	£5.95	Link
Astroplaner	Arc	Spectrum	£5.99	Romik
Atom Smasher	Arc	Electron	£6.95	Romik
Bank Robber	Arc	ZX81	£4.99	Romik
Biocharts	Ut	Spectrum	£12.00	Orange
Birds of Prey	Arc	Electron	£6.99	Romik
Bubble Trouble	Arc	Spectrum	£5.95	Arcade
Castle Frankenstein	Ad	BBC	£9.95	Epic
Centipede	Arc	ZX81	£3.99	Quantum
Chickaroo	Ed	BBC	£7.95	Screenplay
Chuckie Egg	Arc	Dragon 32	£6.90	A & F
City	S	Spectrum	£5.95	Terminal
Composer	Ut	Oric	£9.99	Sector 7
Dancing Feats	Ut	Commodore 64	£9.95	Artic
Farmer	Arc	Spectrum	£4.95	Link
Fighter Pilot	S	Spectrum	£7.95	Digital Integration
Flight 015	S	Vic 20	£9.95	AVS
Forty Niner	Arc	ZX81	£5.95	Software Farm
Graphs	Ut	Spectrum	£12.00	Orange
Hydrus	Arc	Dragon 32	£4.95	Sphinx
Illustrator	Ut	BBC	£9.95	Screenplay
Jogger	Arc	Oric/Spectrum	£5.95	Severn
Junior Word Splits	Ed	BBC B	£9.95	Sulis
Just a Mo!	Ed	Spectrum/BBC	£9.95	Sulis
Keydefine	Ut	Spectrum	£4.95	Scientific
Loch-Ness Monsters	Arc	Oric 48K	£8.95	Romik
Mad Monty	Arc	Dragon 32	£7.50	Screenplay
Magic Madnes	Arc	Spectrum	£5.95	CDS
Mothership	Arc	Commodore 64	£6.95	Artic
Mountains of Ket	Ad	Spectrum	£5.50	Incentive
Nosferatu	Ad	Vic20	£9.95	Terminal
Paddington & Picture Problem	Ed	Spectrum	£8.10	Collins
Paddington & Shopping Mix Up	Ed	Spectrum	£8.10	Collins
Paddington and the Disappearing Ink	Ed	Spectrum	£8.10	Collins
Paddington's Easy Visit	Ed	Spectrum	£8.10	Collins
Pirates	Ed	BBC	£7.95	Screenplay
Pettit	Arc	Commodore 64	£6.99	Romik
Revenge	Arc	Commodore 64	£7.50	Llamasoft
Royal Birkdale	S	Spectrum	£5.90	Ocean
Sound Dive	Arc	Spectrum	£5.95	Durell
Space Shuttle	S	BBC B	£8.00	Microdeal
Sprite Master	Ut	BBC B	£9.95	Soft Machine
The Grammar Tree	Ed	BBC/Spectrum	£19.95	Sulis
The Kingdom of Klein	Ad	BBC	£9.95	Epic
The Quest for the Holy Grail	Ad	BBC	£9.95	Epic
Titles and Listings	Ut	Spectrum	£12.00	Orange
Wilfred	S	Spectrum	£5.95	Microbyte
Wordpower	Ed	Spectrum	£8.95	Sulis
Zappy Zooks	Arc	Commodore 64	£8.95	Romik

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD

Key Ad — adventure/Arc — arcade/Ed — education/ S — strategy simulation/Ut — utility

Book Ends

EXPERT

Ninety percent of the time, when we consult experts for advice, all we are really doing is asking for a fact derived from a series of known other facts, eg find an illness that produces symptoms x, y, and z but not a, b, and c = whatever. The, often highly paid, professional is being asked to do no more than a computer running a fairly simple program — manipulate a lot of data. Hence expert systems.

The idea of the expert system is to use computers for just this task — giving them large databases of information from which they match known facts with your answers to a series of questions, producing a conclusion.

Even on a microcomputer it is now possible (using disc drives) to produce expert systems for some simple purposes.

All this is by way of justification for saying that *Build your own Expert System* by *Chris Naylor* is one of the most interesting new books I've read recently — it contains lots of useful information, as well as mini expert-system listings for the Apple and Spectrum.

Book *Build your own Expert System*
Price *£6.95*
Micro *General (programs Spectrum and Apple)*
Supplier *John Wiley & Sons, Baffins Lane, Chichester, West Sussex, England PO19 1UD*

STRUCTURE

As we all know, the BBC has excellent Basic which allows for things like structured programming and other delights by the use of Procedures.

A book devoted to this subject is *Using BBC Basic* which looks a definitive guide to the subject.

It is the sort of book you would buy after you have read through the 'absolute moron's guide to making the machine do something' type books. It deals with things like turtle graphics, data types, use of *Goto's*, function definitions, interfaces and so on.

Book *Using BBC Basic*
Price *£6.95*
Micro *BBC*
Supplier *John Wiley & Sons, Baffins Lane, Chichester, West Sussex, England PO19 1UD*

Top 10

BBC*

1 (6) Rocket Raid (Acornsoft)
2 (1) Planetoids (Acornsoft)
3 (—) Killer Gorilla (Program Power)
4 (8) Monsters (Acornsoft)
5 (4) Chess (Acornsoft)
6 (—) 747 Flight Simulator (DACC)
7 (9) White Knight Mk 2 (BBC)
8 (—) Sphinx Adventure (Acornsoft)
9 (2) Hopper (Acornsoft)
10 (—) Disc Doctor (Computer Concepts)†

All model B. †Rom.
(Figures compiled by Micro Management Ipswich 0473 59181)

Atari

1 (3) Zaxxon (Datasoft)
2 (1) Miner 2049er (Big Five)*
3 (—) Pooyan (Datasoft)†
4 (4) Ultima II (Sierra On-Line)§
5 (—) Enchanter (Infocom)†
6 (—) Planet Fall (Infocom)†
7 (—) Golden Baton (Channel 8)
8 (10) Preppie (Adventure International)
9 (—) Firefleet (English)†
10 (—) Sitson Warrior (Epyx)*

*Cartridge †32K cassette §48K disc.
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Dragon

1 (2) Mined Out (Quicksilva)
2 (1) Pettigrew's Diary (Shards)
3 (—) Night Flight (Salamander)
4 (7) Ring of Darkness (Wintersoft)
5 (3) Dragonfly 2 (Hewson)
6 (—) Gridrunner (Salamander)
7 (10) Champions (Peaksoft)
8 (—) Lionheart (Peaksoft)
9 (—) Frogger (Microdeal)
10 (—) Morocco Grand Prix (Microdeal)

(Figures compiled by Boots & Co/Websters)

Vic 20

1 (2) Arcadia (Imagine)
2 (9) Wizard and the Princess (Melbourne House)
3 (1) Wacky Waiters (Imagine)
4 (—) Laserzone (Llamasoft)
5 (—) Matrix (Llamasoft)
6 (8) Gridrunner (Llamasoft)
7 (7) Skyhawk (Quicksilva)
8 (—) Sargon II Chess (Commodore)
9 (—) Money Manager (Commodore)
10 (—) Panic (BugByte)

(Figures compiled by Boots & Co/Websters)

Spectrum

1 (2) Atic Atac (Ultimate)
2 (3) The Pyramid (Fantasy)*
3 (1) Chequered Flag (Psion)*
4 (5) Flight Simulation (Psion)*
5 (7) Manic Miner (Bug Byte)*
6 (4) 3D Ant Attack (Quicksilva)
7 (6) Lunar Jetman (Ultimate)
8 (—) Pool (CDS)
9 (5) Kong (Ocean)*
10 (8) Splat (Incentive)*

*Requires 48K
(Figures compiled by WH Smith and Son London)

Books

1 (2) Spectrum Microdrive Book, *Logan* (Melbourne House)
2 (—) Advanced User Guide for the BBC Micro, *Bray* (Cambridge Micro Centre)
3 (4) Advanced Graphics for the ZX Spectrum, *Angell and Jones* (Macmillan)
4 (—) Structured Programming with BBC Basic, *Atherton* (Horwood)
5 (1) BBC Micro Disk Companion, *Latham* (Prentice Hall)
6 (—) Graphics on the BBC Micro, *Cryer* (Prentice Hall)
7 (—) Anatomy of the Dragon, *James* (Sigma)
8 (—) Spectrum Hardware Manual, *Dickens* (Melbourne House)
9 (—) Z80 Assembly Language Programming, *Leventhal* (Osborne)
10 (—) Assembly Language Programming on the BBC Micro, *Birnbaum* (Macmillan)

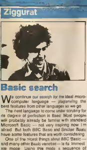
(Figures compiled by Watford Technical Books, Watford 0923 23384 Prestel 28844)
(Last week's position in brackets)

ZX81*

1 (4) Defender (Quicksilva)
2 (1) Asteroids (Quicksilva)
3 (1) Asteroids (Quicksilva)
4 (9) Mothership (Sofsync)
5 (3) 1K Chess (Artic)*
6 (—) Space Raiders (Psion)
7 (—) Fantasy Games (Psion)
8 (7) Invaders (Quicksilva)
9 (—) Inca Curse (Artic)
10 (—) ZX Forth (Artic)

All run in 16K. †1K only
(Figures compiled by Boots & Co/Websters)

Ziggurat



Basic search

We continue our search for the ideal microcomputer language — plagiarising the best features from other languages as we go

The next language to come under scrutiny for its degree of perfection is Basic Most people will probably already be familiar with standard Microsoft Basic — not very inspiring now I'm afraid But both BBC Basic and Sinclair Basic have some features that are worth considering

One of the nicest things about BBC Basic — and many other Basic varieties — is its immediate mode Using this mode a sequence of statements can be typed into the computer without writing a program

Traditional compiled languages such as Pascal can obviously not support this facility Our perfect language is however available in both interpreted and compiled forms The interpreted version will probably use a sophisticated screen editor for program entry I personally favour the Sinclair-like approach of dividing the screen into two parts The bottom region takes up a single line at the bottom of the screen whilst the top section takes up the rest of the screen The top region can be viewed as a window on to the source text which can be scrolled and manipulated much like a simple word processor (for example the BBC Micro's *WordWise*) If the cursor is moved into the bottom region immediate commands can be given such as *Run* and the more complex editing commands, like *Search* and *Replace*

BBC Basic will merrily convert integers to floating-point representation and vice versa to do a calculation This feature lacking from Pascal as we discussed last time is well worth implementing

On the whole BBC Basic gives good error messages However our ideal language should really improve on them Ideas include printing No such variable as *XXXX* when an undefined variable is met This way errors like *If A = B then Goto ***** (from BBC Basic) will be easier to see In addition when an error occurs the editor should be run with the cursor over the error

Another nice feature of BBC Basic is its speed This is more to do with the interpreter than anything else For example in the handling of floating point numbers it is often necessary to shift a number of bytes left by a certain number of bits

BBC Basic examines the number of bits to be shifted (say *N*) and breaks it down to the number of bytes to be shifted (*N Div 8*) and the number of bits (*N Mod 7*) Thus the worst case involves three byte shifts and seven bit shifts

In contrast the Spectrum *Rom* which is appallingly written from the point of view of speed and elegance handles the same thing by carrying out the required number of shift instructions on each byte in turn Thus up to 32 shifts are required

The conclusion to be drawn from all this is that our ideal language must be very carefully written It would also make sense to design the language with the compiler and interpreter in mind It would not be wise to limit the language to simplify the coding of the interpreter/compiler but it would be intelligent to find another way of doing something that is sapping vast amounts of time and space in the compiler/interpreter

A good feature of Sinclair Basic is the provision for syntax checking on entry This only need be implemented on our interpreter since the compiler will use the interpreter as the editor used to create the source program Unfortunately Spectrum syntax checking is carried out in a rather slow and laborious manner

My solution is to employ simple recursive syntax checking based on the popular Backus-Noir syntax diagrams.

One feature of most versions of Basic which is poor is the surfeit of available functions I am more in favour of limiting the functions available and implementing others via outside libraries which may be written in interpreted mode assembly language or compiled code

Jeremy Ruston

Puzzle

Santa tanned

Puzzle No 87

Stanley Allbright has a seasonal occupation as Father Christmas in one of the nation's biggest department stores

He prides himself on his authentic appearance with red tunic yak hair beard and black wellie boots borrowed from his brother in the fire service

Unfortunately on Christmas Eve at the height of the Christmas shopping rush an unfortunate occurrence cast a shadow over Stanley's otherwise peaceful career One little girl called Ann took violent exception to his appearance Before Stanley could be rescued she had seized one of the imitation conifers and was heavily belabouring him about the head Temporarily blinded Stanley staggered about the fairy grotto crushing elves and pixies alike beneath his fireman's size tens

The resulting pandemonium was reported the next day in the local paper under the headline *ANN TANS STAN S SANTA.*

By adding some mathematical symbols it is possible to make a puzzle

ANN + TANS + STANS = SANTA

Substituting numbers for letters it is possible to make the equation make sense

What are the numbers?

Solution to Puzzle No 82

The program generates sets of possible squares with the variable *x* being the largest of each set of five These sets are then checked to see if the linear total and area are equal

```
10 FOR X = 1 TO 12 20 FOR A = 1 TO X 30 FOR B =
1 TO X 40 FOR C = 1 TO X 50 FOR D = 1 TO X 60 IF
D + C <> A + B + X THEN GOTO 100 70 IF C * C +
D * D <> A * A + B * B + X * X THEN GOTO 100 80
PRINT X " "A" "B" "C" "D 100 NEXT D 110
NEXT C 120 NEXT B 130 NEXT A 140 NEXT X
```

If we disregard all sets of possible values containing similar sized squares we arrive at the following eight possibilities (6, 1, 2 and 4, 5), (8, 1, 3 and 5, 7) (10, 1, 4 and 6, 9) (10, 2, 3 and 7, 8) (12, 1, 5 and 7, 11) (12, 1, 6 and 9, 10) (12, 2, 3 and 8, 11), and (12, 2, 4 and 8, 10)

Winner of Puzzle No 82

The winner is David Woodall Toc H Services Club BMH Berlin BFPO 45 who receives £10

